Infinity

Modulus®

MSW-1 Subwoofer

Service Manual

Infinity Systems, Inc
250 Crossways Park Dr.
Woodbury, New York 11797

REV 5 11/2002

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Basic Specifications
Modulus MSW-1 Powered Subwoofer

Frequency Range:	27Hz – 100Hz (±3dB)
Amplifier Output:	300 watts RMS, 600 watts peak
Low-Frequency Driver:	12" C.M.M.D.,magnetically shielded
Crossover Frequency:	100 Hz (12 dB per octave)
Dimensions (H x W x D):	16-1/2" x 14-1/2" x 19-1/4"
	(419mm x 368mm x 489mm)
Weight:	42 lb (19.1kg)

Infinity continually strives to update and improve existing products, as well as create new ones. The specifications and construction details in this and related Infinity publications are therefore subject to change without notice.

DETAILED SPECIFICATIONS

Modulus subwoofer **300W Powered Sub/ Plate Amp**

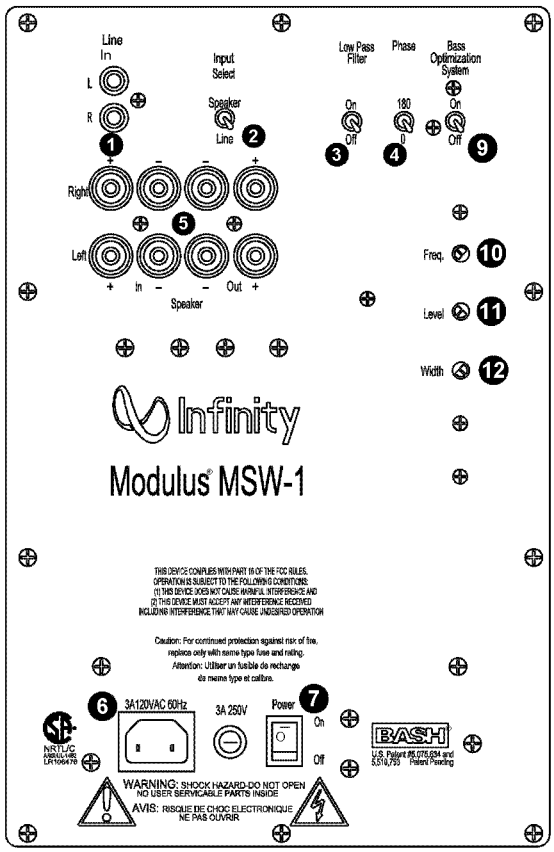
LINE VOLTAGE	Yes/No	Hi/Lo Line	Nom.	Unit	Notes
US 120vac/60Hz	Yes	108-132	120	Vrms	Normal Operation
EU 230vac/50-60Hz	Yes	207-264	230	Vrms	Normal operation, MOMS required

Parameter	Specification	Unit	QA Test Limits	Conditions	Notes
Amp Section					
Type (Class AB, D, other)	AB	---			
Load Impedance (speaker)	4	Ohms		Nominal	Z-curve required
Rated Output Power	300	Watts		1 input driven, 50Hz	
THD@ Rated Power	1	%		22k filter, 50Hz	300W
THD @ 1 Watt	0.05	%		22k filter, 50Hz	
DC Offset	--	mV-DC		@ Speaker Outputs	
Damping factor	> 40	DF		based on amp type	5-800Hz
Input Sensitivity					
Line/Hi Level Input Phase	Same	--			
Line Input	200	mVrms		To Rated Power, @50Hz	1 input driven
Speaker/Hi Level Input	2	Vrms		To Rated Power, @50Hz	1 input driven
Signal to Noise					
SNR-A-Weighted	100	dBA		relative to rated power	A-Weighting filter
SNR-unweighted	70	dBr		relative to rated power	22k filter
SNR rel. 1W-unweighted	60	dBr		relative to 1W Output	22k filter
Residual Noise Floor	2	mVrms		Volume @max, using RMS reading DMM/VOM (or A/P)	
Residual Noise Floor	1	mVrms(max)		Volume @max, w/ A/P Swept Bandpass Measurement (Line freq.+ harmonics)	
Input Impedance					
Line Input	10k	ohms		Nominal	
Speaker/Hi Level Input	1k	ohms		Nominal	
Active Filters					
Low Pass (fixed or variable)	fixed	--			
Frequency	100	Hz			
Slope	24	dB/Octave		quote for 3rd and fourth order	
Subsonic filter (HPF)	fixed	--			
Frequency	20 - 35	Hz			
Slope	12	dB/Octave			
Q	0.5 - 2.5	Damping			
Friend Circuit	fixed	--			
Frequency	64Hz	Hz		notch filter	
Special filter	RABOS	--			
Switches					
Main Power On/Off Switch	yes	--		"On": LED green; "Off": LED orange	
Type	Rocker	--		Locate at amp plate	
Line/Spkr Input Select Switch	yes	--			
Polarity Switch	yes	--		"Off": 0°; "On": 180°	
Low Pass Filter	yes				
RABOS On/Off	yes				
Limiter (yes/no)	yes				
THD at Max. Output Power	5	%		Maximum Output Power	Maximum THD as a result of limiting.
Output Volume Control					
Volume Control Pot	yes	--		harness for pot and LED to be remotely mounted	
Taper (lin/log)	linear	--			
@minimum setting	no output	dB			
Input/Output Phase					
Line Input vs. Hi Input	0	°			
Lo/Hi Input vs. Lo/Hi Output	0	°			
Input/Output Configuration					
Line In (L,C,R,AC3,Mono)	Stereo	--		RCA phono jack, gold plated	
Spkr/Hi Level In (L,C,R,mono)	Stereo	--		TBD length 18 AWG from amp PCB (connected to +/- FASTON blades)	
LFE In	single	--		RCA phono jack, gold plated	Location should be mis-aligned with Line In jac
Hi Level Out	Yes	--			
Hi Level Out: Hi Pass Filter	100	Hz			

DETAILED SPECIFICATIONS (Cont.)

Amp Section					
Type (Class AB, D, other)	AB	---			
Signal Sensing (ATO)	yes				
Power on Features					
Power on Delay time	>2	sec.		AC Power Applied	
Power on LED	yes	--		Bi-color LED located at amp plate	
Normal On/Off	green/orange	color		"On": green; "Off": orange; AC power absent: no light	
ATO	--	color		"Active": green; "Standby": red	
Transients/Pops					
ATO Transient	5	mV-peak		@ Speaker Outputs	
Turn-on Transient	30	mV-peak		@ Speaker Outputs	AC Line cycled from OFF to ON
Turn-off Transient	30	mV-peak		@ Speaker Outputs	AC Line cycled from ON to OFF
Efficiency					
Stand-by Input Power	10	Watts		@ nom. line voltage	
AC Power Cons.@1W	26	Watts		@ nom. line voltage	
Power Cons.@rated power	600	Watts		@ nom. line voltage	
Efficiency	50	%			
Protection					
Short Circuit Protection	yes	--		Direct short at output	
Thermal Protection	yes	--		@1/8 max unclipped Power	
DC Offset Protection	yes	--		DC present at Speaker Out lead	Relay or crowbar (for driver/fire protection)
Line Fuse Rating	3	Amps		Type-T or Slo Blo	External fuse with UL/SEMKO rated holder

CONTROLS



00538-1

1. Line-Level Inputs
2. Input Selector
3. Low-Pass Filter Selector
4. Phase Switch
5. Speaker-Level Connectors
6. AC Cord Input
7. Power Switch
8. Subwoofer Gain Control

Room Adaptive Bass Optimization System Controls (R.A.B.O.S.)

9. R.A.B.O.S. On/Off Switch
10. Center-Frequency Adjustment
11. R.A.B.O.S. Level
12. Bandwidth Adjustment

A Few Suggestions

We recommend that you do not operate your speakers or subwoofer with the bass, treble and loudness controls set to full boost. This will place undue strain on your electronics and speakers and could damage them.

The volume control setting on your processor/preamp or receiver is not a specific indication of the overall loudness level of the speakers. The only important consideration is the loudness level at which the system can be played, regardless of where the volume control is set.

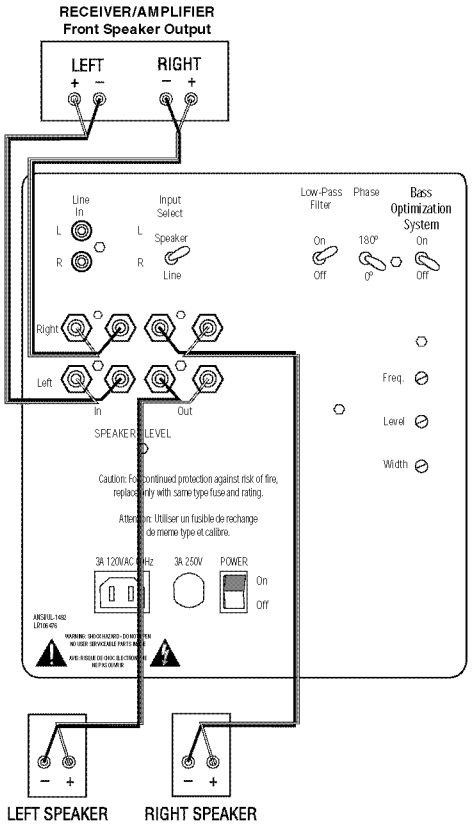
Always turn down the volume control setting on your processor/preamp or receiver when changing a cassette or CD, or switching inputs to AM or FM operation. Excessively loud transients (clicks or popping sounds) can damage the satellite speakers and possibly the subwoofer.

Important!

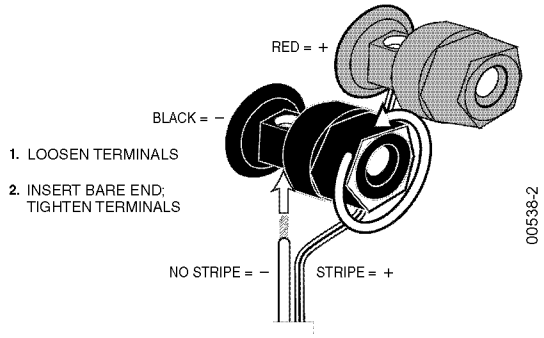
Whenever changing cables, pulling plugs, etc., ALWAYS TURN OFF ALL EQUIPMENT, including the subwoofer. This prevents transients from entering the speakers and prevents electrical energy from reaching you. Keep all connections out of the reach of children.

CONNECTIONS

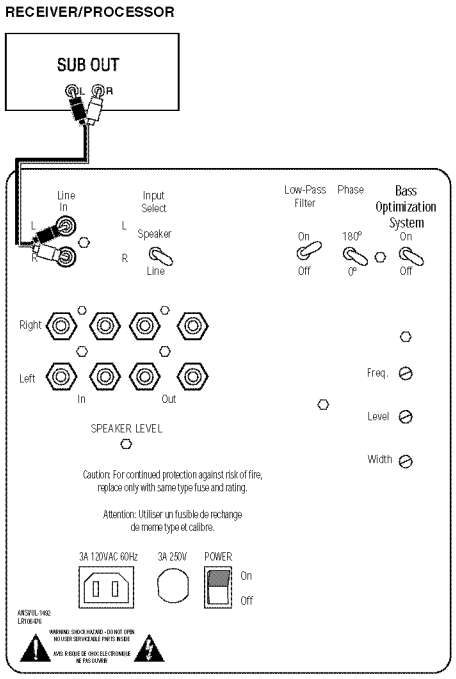
If your receiver/processor does not have subwoofer outputs for the left and right channels or an LFE output:



- Set Input Selector to "Speaker."
- Set Low-Pass Filter to "On."

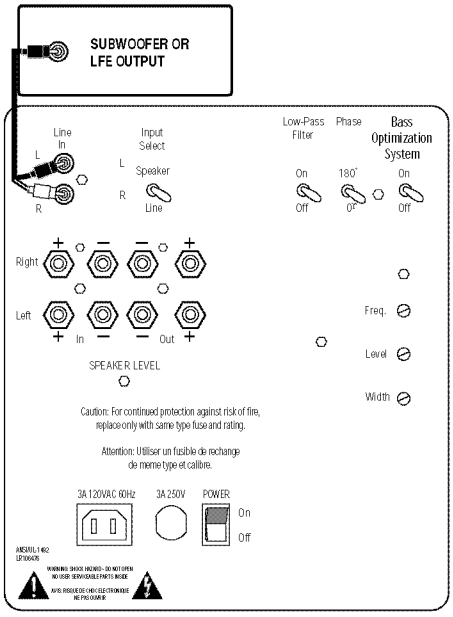


If your receiver/processor has subwoofer outputs for the left and right channels:



- Set Input Selector to "Line"
- Set Low-Pass Filter to "On."

If you have a Dolby* Digital or DTS® receiver/processor with a low-frequency-effect (LFE) output:



- Set Input Selector to "Line."
- Set Low-Pass Filter to "Off."

Note: Some receivers have a single subwoofer output. In that case, it is recommended that you use a Y connector (not included) to maximize performance.

OPERATION

Surround Modes

When using the Modulus system in a Dolby* Pro Logic* home theater system, make sure the receiver's center-channel mode is set to “Normal”. When using the Modulus system in a Dolby Digital or DTS home-theater system, make sure the receiver’s speaker modes are set to “Small”.

Some Dolby Digital-equipped receivers/processors offer different setup options for each source or surround mode: e.g., CD-stereo, videotape, Dolby, Pro Logic. In each case, follow your equipment’s instructions to ensure that the subwoofer output is turned on and that the speakers are set to “Small” in each mode.

Power On

Plug your Modulus subwoofer’s AC cord into a wall outlet. Do not use the outlets on the back of your receiver.

Initially set the subwoofer’s Gain Control (8) to the “O” position.

Turn on your sub by flipping the Power Switch (7) on the rear panel to the ON position.

Turn on your entire audio system and start a CD or movie sound-track at a moderate level.

Adjust Gain

Turn your subwoofer’s Gain Control (8) up to the “5” position (half way). If no sound emanates from the subwoofer, check the AC-line cord and input cables. Are the connectors on the cables making proper contact? Is the AC plug connected to a “live” receptacle? Has the Power Button (7) been pressed to the “ON” position? (Note: The Gain Control (8) on the front panel will turn green when the power is on.) Once you have confirmed that the subwoofer is active, proceed by playing a sound source. Use a selection that has ample bass information.

Set the overall volume control of the preamplifier or stereo to a comfortable level. Adjust the subwoofer’s Gain Control (8) until you obtain a pleasing blend of bass. Bass response should not overpower the room but rather be adjusted so there is a harmonious blend across the entire musical range. Many users have a tendency to set the subwoofer volume too loud, adhering to the belief that a subwoofer is there to produce lots of bass. This is not entirely true. A subwoofer is there to enhance bass, extending the response of the entire system so the bass can be felt as well as heard. However, overall balance must be maintained or the music will not sound natural. An experienced listener will set the volume of the subwoofer so its impact on bass response is always there but is never obtrusive.

Phase Control

The Phase Switch (4) determines whether the subwoofer speaker’s piston-like action moves in and out with the main speakers, 0° or opposite the main speakers, 180°. Proper phase adjustment depends on several variables such as room size, subwoofer placement and listener position. Adjust the phase switch to maximize bass output at the listening position.

NOTICE

The operation of the Modulus MSW-1 Home Theater System regarding the proper settings for the Room Adaptive Bass Optimization System, or R.A.B.O.S., is thoroughly covered in the Owner’s guide, part# 336782-001.

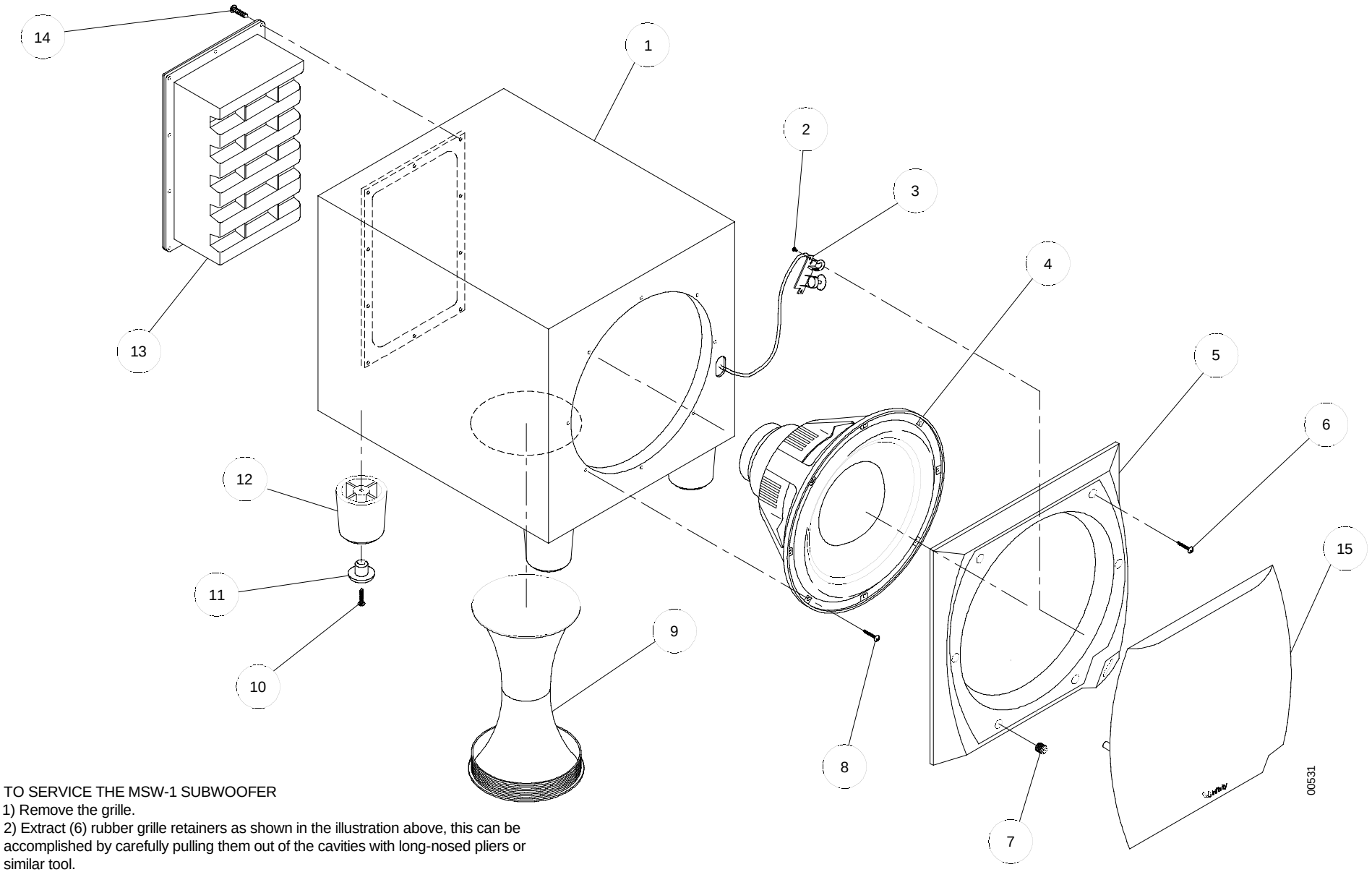
For service purposes, the R.A.B.O.S. system is canceled when front panel switch “Bass Optimization System” is switched OFF.

The only other control of concern is the Main Level Control on the front panel, which operates like a traditional potentiometer.

MECHANICAL/PACKAGING PARTS LIST

Item Number	Description		Part Number
MECHANICAL			
1	CABINET (CHARCOAL OR PLATINUM)		Not for Sale
2	SCREW, (3) 6-19x .375, MS, PPH, H/L, BLK		905401-006
3	VOLUME CONTROL PCB		336787-001
4	12” WOOFER C.M.M.D.,SHIELDED, DCR = 3.4Ω ±10%		336786-001
5	FRONT BAFFLE	(Charcoal) (Platinum)	336771-002 336771-001
6	SCREW, (6) #8 x .75, PB, PPH, BLK		905401-006
7	GRILLE CUP (6)	(Charcoal) (Platinum)	336880-002 336880-001
8	SCREW, (8) #8 x .75, PB, PPH, BLK		905401-006
9	PORT TUBE		336804-001
10	SCREW, (4) #8 x 1, PB, TRPH, BLK		903101-016
11	FOOT PAD (4)		334192-001
12	FOOT (4)	(Charcoal) (Platinum)	334186-004 334186-003
13	AMPLIFIER ASSEMBLY		Not for Sale
14	SCREW, (10) #8 x .75, PB, PPH, BLK		905401-006
15	GRILLE	(Charcoal) (Platinum)	336770-002 336770-001
PACKAGING			
16	SYSTEM, 4+1-MODULUS SAT/CTR		
17	OWNER’S MANUAL		336782-001
18	SURVEY CARD		335868-002
19	WARRANTY CARD		335841-001
20	RABOS KIT		335852-002
21	END PAD, TOP		336784-001
22	SYSTEM CARTON		336779-001
23	END PAD, BOTTOM		336784-002
24	POWER CORD		336658-115

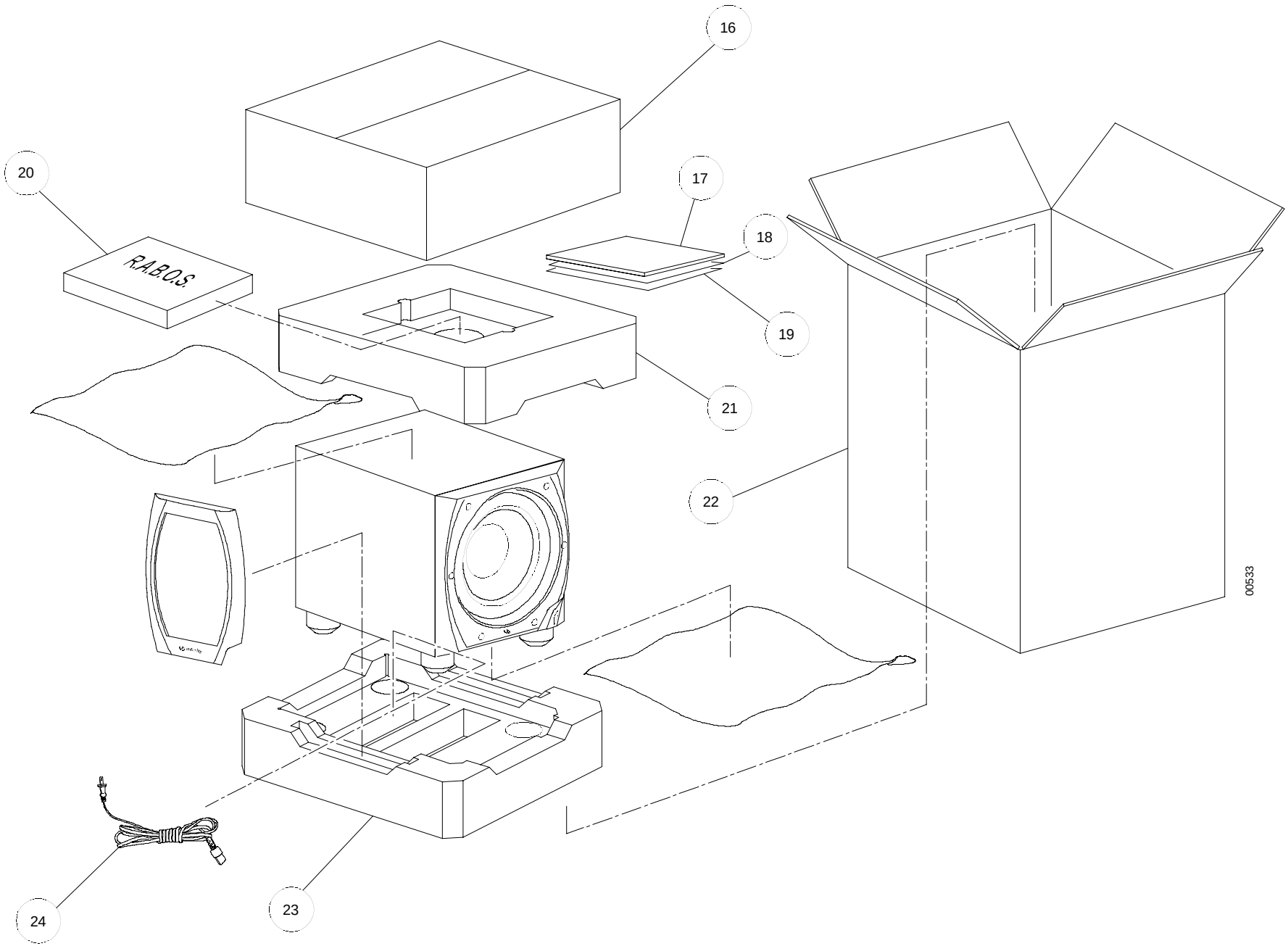
EXPLODED VIEW



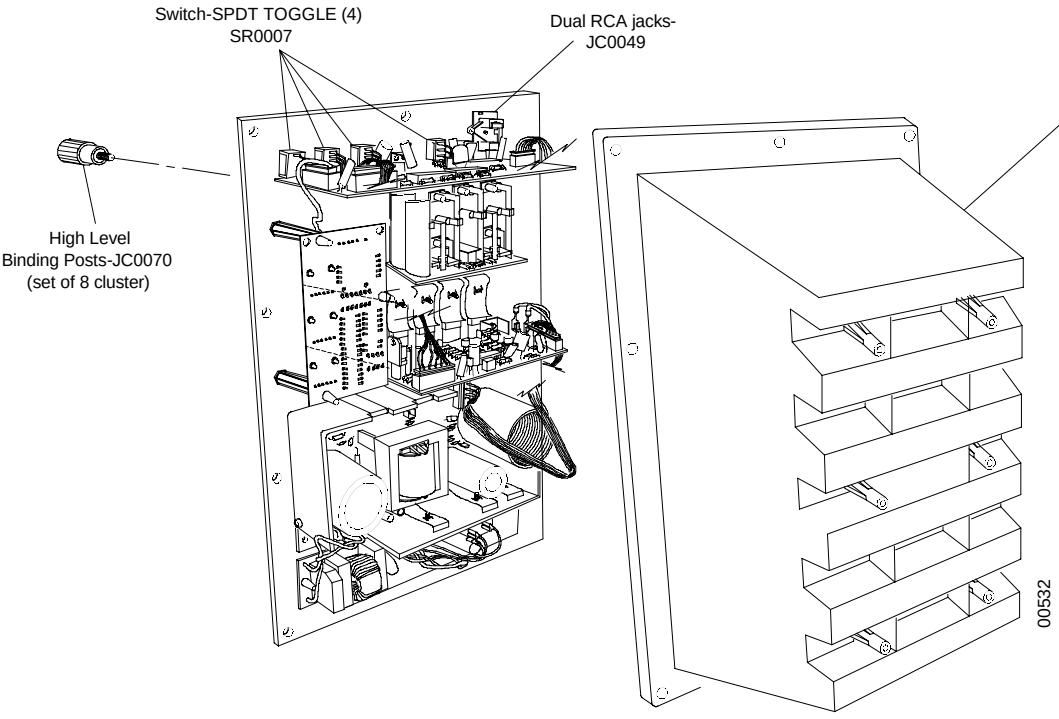
TO SERVICE THE MSW-1 SUBWOOFER

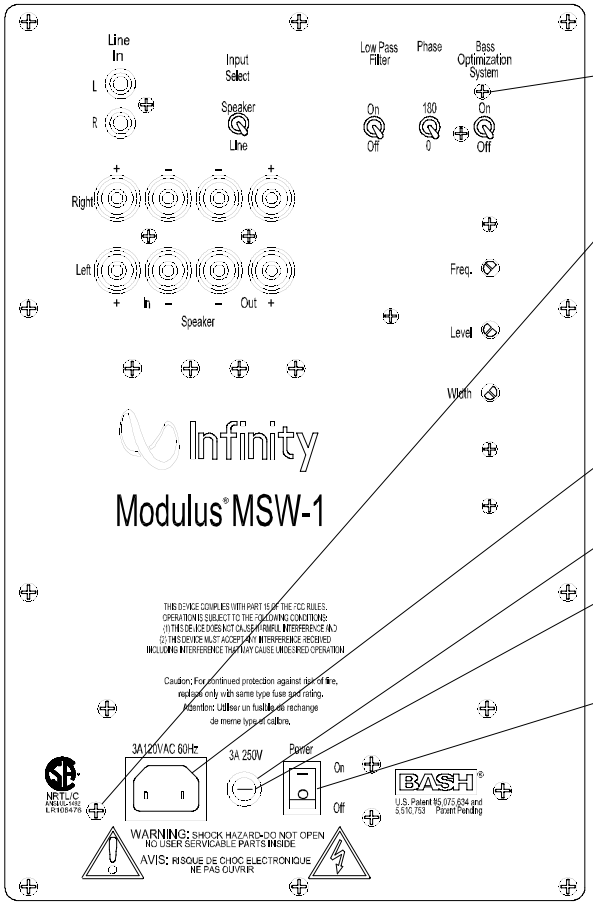
1) Remove the grille.
2) Extract (6) rubber grille retainers as shown in the illustration above, this can be accomplished by carefully pulling them out of the cavities with long-nosed pliers or similar tool.
3) Remove the (6) Phillips screws that are now exposed.
4) Remove the front baffle.
5) Remove the (8) screws that secure the driver.
6) To service the amplifier, remove the (10) Phillips screws at the rear of the enclosure, and pull the amplifier out of the back.

PACKAGING



EXPLODED VIEW OF AMP





REMOVE THESE SCREWS TO SEPARATE REAR COVER FROM AMP PLATE

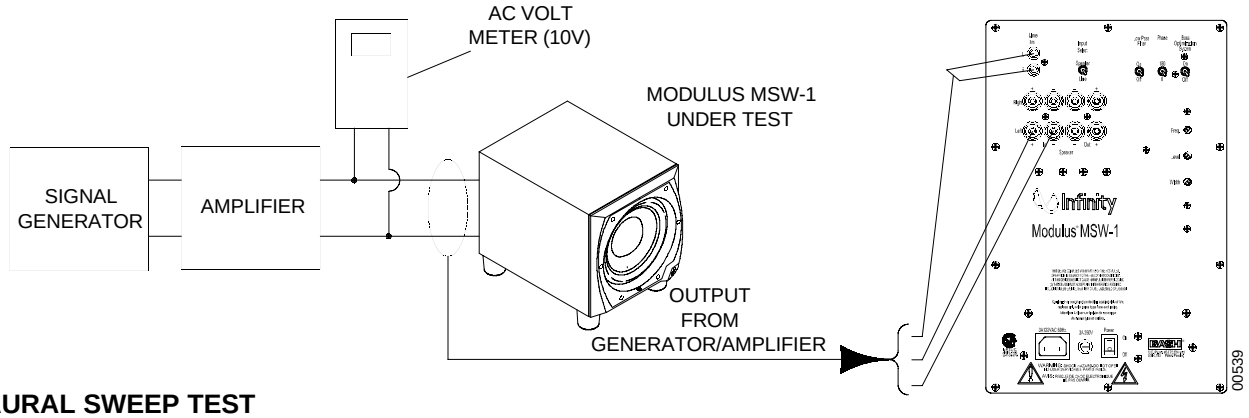
AC SOCKET
JC0129

FUSE HOLDER
FH0012

FUSE 3A 1.25 x .25
FS0022

POWER SWITCH
SR0032

TEST SETUP and PROCEDURE



SYSTEM AURAL SWEEP TEST
Equipment needed:

- Function/signal generator/sweep generator
- Integrated Amplifier
- Multimeter
- Speaker cables

General Unit Function (UUT = Unit Under Test)
Switches/knobs on the amplifier faceplate:
Input Select to "Line"
Low Pass Filter switch to OFF
Bass Optimization switch to OFF
Phase switch - either position

1. From the signal generator, Connect both right and left line level inputs (RCA) to signal generator and UUT. Use Y-cable if necessary from mono source.
2. On the front of the unit, turn the LEVEL control full clockwise (0).
3. Turn on generator, adjust to **120mV, 30 Hz**.
4. Plug in UUT; turn the power switch ON. LED should be Red. Turn LEVEL control full counterclockwise (10)
5. LED should now be Green; immediate bass response should be heard and felt from bottom port tube opening.
6. Turn off generator, turn LEVEL control fully clockwise (0), disconnect RCA cable.
7. Connect one pair of speaker cables to Speaker Level input terminal on UUT. Cables should be connected to an integrated amplifier fed by the signal generator.
8. Change Input selector switch to "Speaker".
9. Turn on generator and adjust so that speaker level input at the amplifier is **2.2V, 30 Hz**.
10. Turn LEVEL control full counterclockwise (10)
11. Green LED should light, immediate bass response should be heard and felt from the port tube opening.

Sweep Function

1. Follow steps 7-10 above, using a sweep generator as a signal source.
2. Sweep generator from 20Hz to 1kHz. Listen to the cabinet and drivers for any rattles, clicks, buzzes or any other noises. If any unusual noises are heard, remove woofer and test.

Driver Function (Woofer)

1. Remove woofer from cabinet; detach + and - wire clips. See page 9 for removal instructions.
2. Check DC resistance of woofer; it should be **3.4 ohms**±10%.
3. Connect a pair of speaker cables to driver terminals. Cables should be connected to an integrated amplifier fed by a signal generator. Turn on generator and adjust so that speaker level output is 5.0V.

4. Sweep generator from 20Hz to 1kHz. Listen to driver for any rubbing, buzzing, or other unusual noises.

Service Bulletin

Service Bulletin INF2002-01 - February 2002 | Warranty labor rate: MINOR repair

To: All Infinity Service Centers

Model: Modulus MSW-1 Subwoofer

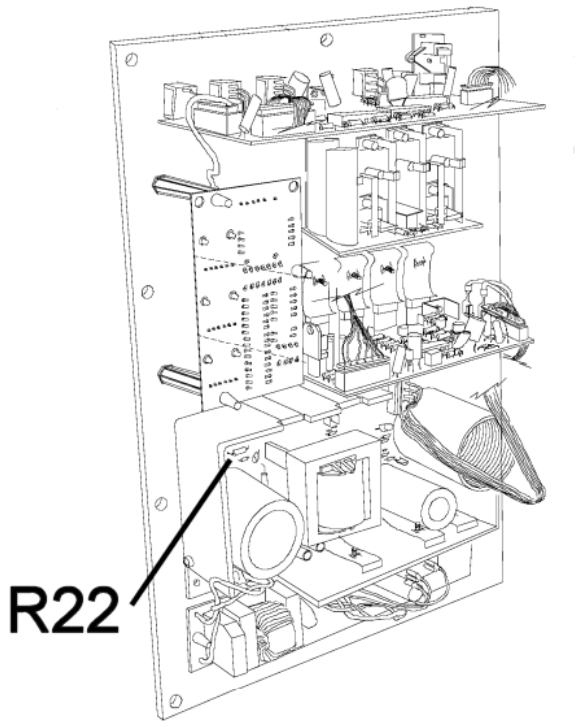
Subject: No Output

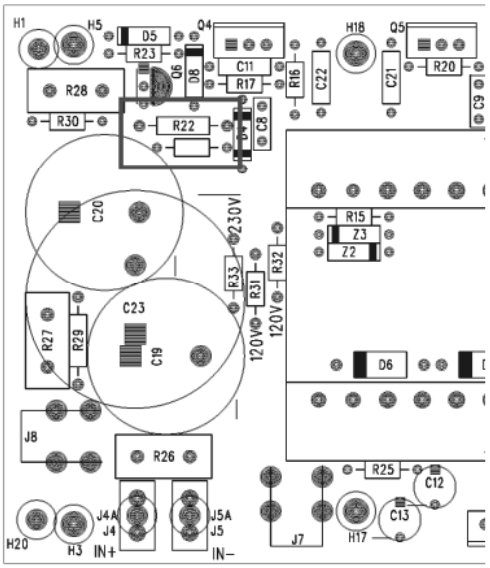
In the event you receive a Modulus MSW-1 subwoofer with the complaint: "There is no output, and the LED on the volume control does not light, red or green", check the items listed below:

Check the 3A line fuse to make sure it's not open. If open, replace with a 3A MDL (.25 x 1.25) slo-blo fuse, Infinity part# 80126.

Locate R22 in the power supply section, as shown below.
If value of R22 is not 100k ohms ±5%, then replace R22 with a 1/2 Watt 100k ohm ±5%, resistor.

1. Remove the grille. Lay the subwoofer on its face on a padded surface, amplifier facing upwards.
2. Remove the 10 Phillips screws around the outer perimeter of the amplifier faceplate; remove the amplifier from the cabinet.
3. Remove two Phillips screws on the faceplate to remove the rear plastic cover; they are (1) the screw directly above the Bass Optimization switch and (1) to the left of the power cord receptacle; remove the amp cover.
4. Locate the power supply section and R22 from the illustrations below. R22 can be checked in-circuit and should be 100k ohms ±5%. If it is any other value, or open, replace with Infinity part# RC0082.
5. Reassemble the amplifier, rear cover, replace the amplifier in the cabinet and test the subwoofer.





Infinity

Service Bulletin

Service Bulletin INF2002-06 Rev3 - November 2002 | Warranty labor rate: MAJOR repair

To: All Infinity Service Centers

Model: Modulus Subwoofer MSW-1

Subject: Reliability Upgrade

PURPOSE: Improve reliability of the Modulus MSW-1 subwoofer amplifier; this procedure should be followed for every unit that has to be serviced, for any reason.

PLEASE READ FIRST BEFORE ORDERING PARTS OR SERVICING THE AMPLIFIER.
ORDER PARTS ON AS NEEDED BASIS ONLY

IR = Brand International Rectifier A/R = As required

Infinity Part Number	Ref. Designator	Description	Qty	Comment
QM0061	Q1	MOSFET, IRF540 TO220AB IR ONLY	1	
QM0055	Q4,Q5	MOSFET, IRF740 TO220AB IR ONLY	2	
TS0016		TUBING, #5 BLACK CUT TO .3	A/R	
DR0091	D1	RECT, 15A 200V MUR1540 MOTOROLA ONLY	1	Substitute for DR0087 if not MOTOROLA
810066		HEATSINK, FET CLIP, CLIP ON - NO SCREW	2	Used with heatsink 810156 on U2,U3
810156		HEATSINK, LINEAR VOLTAGE REG	1	
810157		HEATSINK, FET SEC BLACK	1	Replaces 810091
810158		HEATSINK, FET PRIMARY BLACK	1	Replaces 810092
810056		HEATSINK, FET CLIP .9 x .5 x .2	1	Use with Q1
MS0017		MISC, CERAMIC PLATE TO-220, CERAMIC INSULATOR 0.025	5	Use with Q1,3,4,7,8
		Thermal grease	A/R	Use with Q1,3,4,5,7,8, D1,D3
RM0002	R43	RES, MF 10K0 1/4W 1%	1	
KS0027		50 DEGREE PTC THERMISTOR	1	
		RTV DOW CORNING 747 OR EQUIVALENT	A/R	
CE0145	C6	CAP, E 1000uF 100V 18 x 40 105C	1	To replace 85 deg. part
TS0009		HEATSHIRK TUB. 1/16” DIA.	A/R	For KS0026 leads

The repair procedure is to be executed in 3 phases.

1) POWER SUPPLY BOARD UPGRADE - STEPS CORRESPOND WITH FIGURE 1

Step	OPERATION
1.	Q1 - This part must be IR only. Replace with QM0061, MOSFET, IRF540 TO220AB IR if needed. Use TUBING, #5 BLACK cut to .3 (TS0016) to set mounting height to 0.3”.
2.	Q4,Q5. These parts must be IR ONLY. Replace with MOSFET, IRF740 TO220AB IR (QM0055). Q4 and Q5 must have black tubing on component leads: TUBING, #5 BLACK cut to .3 Inch in length (TS0016) or equivalent.

3.	D1 should be MUR1540 MOTOROLA ONLY, if not replace with DR0091, RECT, 15A 200V MUR1540 MOTOROLA
4.	Add a thin ceramic, CERAMIC PLATE TO-220, INSULATOR 0.025 THICK " (MS0017) behind Q1 with thermal grease on both sides of the ceramic. Ensure that grease covers the complete surface of ceramic on both sides.
5.	Remove SILPAD (MS0005 SILPAD, .009" .3C/W TO3P) behind D3 and thoroughly clean the adhesive film with an Alcohol blended cleaner such as IPA etc.
6.	Parts Q4, Q5, D1, D3 must also have thermal grease between the devices and the heatsink.
7.	Verify that C6 is a 106 deg.C part, if not replace with CAP, E 1000uF 100V 105C (CE0145)
8.	Ensure that C11 is 0.0047uF (4700PF 100V 10%). This part must be axial and not a radial part. If not order Infinity Part# CC0040
9.	Ensure that R1, R2 are 0.1 ohm resistors (Color Code - Brown, Black, Silver and Gold) RES, MO 0.1 ohm 2W 5% Metal film, not wire wound. If not order Infinity Part# RX0109
10.	Ensure that Q6 is MPS A92 PNP TO92 MPSA92TR. If not order Infinity Part # QB0014
11.	Ensure that R22 is 100K, 1/2 watt part. (Color Code - Brown, Black, Yellow and Gold), RES, CF 100K 1/2W 5%. If not order Infinity Part# 293-100k
12.	Ensure that R26 is SURGISTOR 10R 2A CL-110 (13S100L) If not order Infinity Part# KS0020
13.	Ensure that R30 is 160K part (Color Code - Brown, Blue, Yellow, Gold), RES, CF 160K 1/4W 5%. If not order Infinity Part# RC0136
14.	Assemble the (new part) PRIMARY BLACK HEATSINK 810158 on the (2) FET(Q4 & Q5) side. ENSURE THAT THE FETS ARE FLUSH AGAINST THE HEATSINK.
15.	Assemble the 810157, HTSNK, FET SEC BLACK heat sink on side of three devices (Q1, D1, & D3) Install FET CLIP 810056 on Q1 (not shown in illustration)

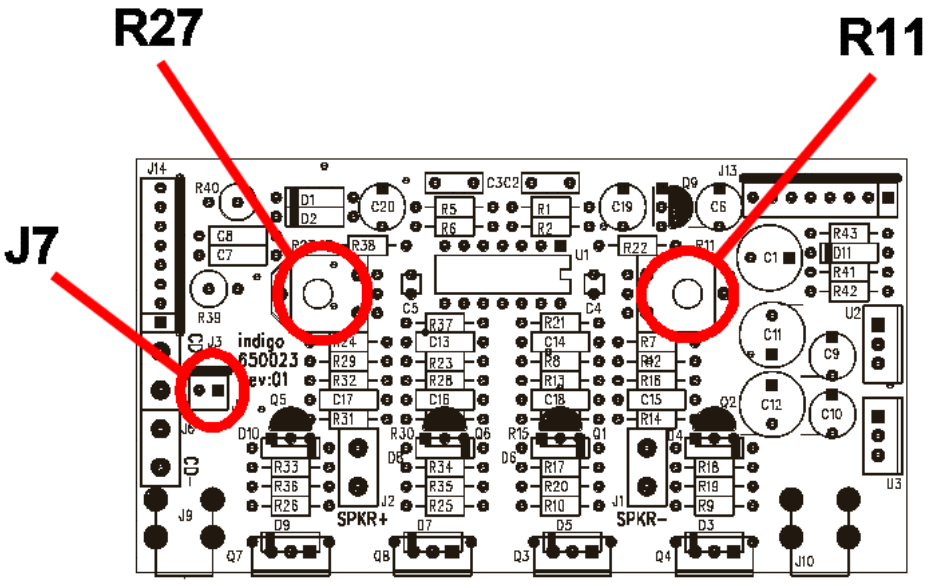
2) LINEAR BOARD UPGRADE

Step	OPERATION
	Remove Linear Board from Amplifier Assembly
A	Remove SILPADS under indicated location “A” in Figure 3 and thoroughly clean surface with IPA or equivalent.
	STEPS CORRESPOND WITH FIGURE 2
1.	Replace R43 with Infinity Part# RM0002, RES, MF 10K0 1/4W 1%
2.	Locate, unsolder and lift a lead from C1 (CAP, E 2.2UF 50V BP 6X11 5MMLS) that is closest to the trim pot, see image.
3.	Mount new Thermistor (KS0026) at linear board mounting point as shown by removing the screw retaining the PCB bracket, inserting the Thermistor and rethreading the screw to hold down both the PCB and Thermistor, the tab “sandwiched” between the bracket and faceplate. Thermistor body should be flush with the faceplate.
4.	Important ! Cover both exposed thermistor leads with Shrink tubing (TS0009)
5.	Solder RC0273 (RES, ZERO OHM 1/4W) to one lead of new Thermistor, as depicted.
6.	Solder other lead of RC0273 to PCB location previously occupied by C1, as depicted.
7.	Solder lifted lead of C1 to Thermistor as depicted.
	STEPS CORRESPOND WITH FIGURE 3
8.	Insert (new part) MS0005, SILPAD, .009" .3C/W TO3P between Heatsink (810156) and both Regulators U2 and U3
9.	Add (new part) HEATSINK, LINEAR VOLTAGE REG (810156):
B.	Apply thermal grease to both surfaces of all (4) of the CERAMIC PLATE TO-220, CERAMIC INSULATOR 0.025” (MS0017), and sandwich between each power device and the faceplate. Replace the screws and clips; tighten.
10.	Secure Voltage regulators U2 and U3 to 810156, HEATSINK, LINEAR VOLTAGE REG using 810066, HEATSINK-FET CLIPS. These clip on and do not use screws
11.	Secure THERMISTOR leads & C1 using RTV DOW CORNING 747 or equivalent as depicted

3) MSW-1 ADJUST BIAS PROCEDURE

(Mandatory when any output MOSFET transistors Q3,4,7,8 are replaced)

1. Locate the Linear board assembly (PCB with the output transistors)
2. Adjust R11 and R27 fully Counter Clockwise. See diagram below.
3. Apply 120 VAC power to unit, Turn power switch ON.
4. Verify LED illuminates on the front gain control dial unless you have disconnected the plug.
5. Remove shorting plug on terminal J7 on Linear board, and insert current meter, set to the low mA range.
6. Verify initial current is less then 1 mA.
7. Adjust R11 Clockwise until current meter reads **5 mA** plus the initial current from step #6.
8. Adjust R27 Clockwise until current meter now reads **10 mA** plus the initial current from step #6.
9. Turn amplifier OFF. Disconnect AC power to unit.
10. Remove current meter; insert shorting plug back in terminal J7.
11. Replace cover (if present), wires if disconnected, and replace amplifier back into cabinet.



Location for Bias pots

FIGURE 1 POWER SUPPLY BOARD UPGRADE

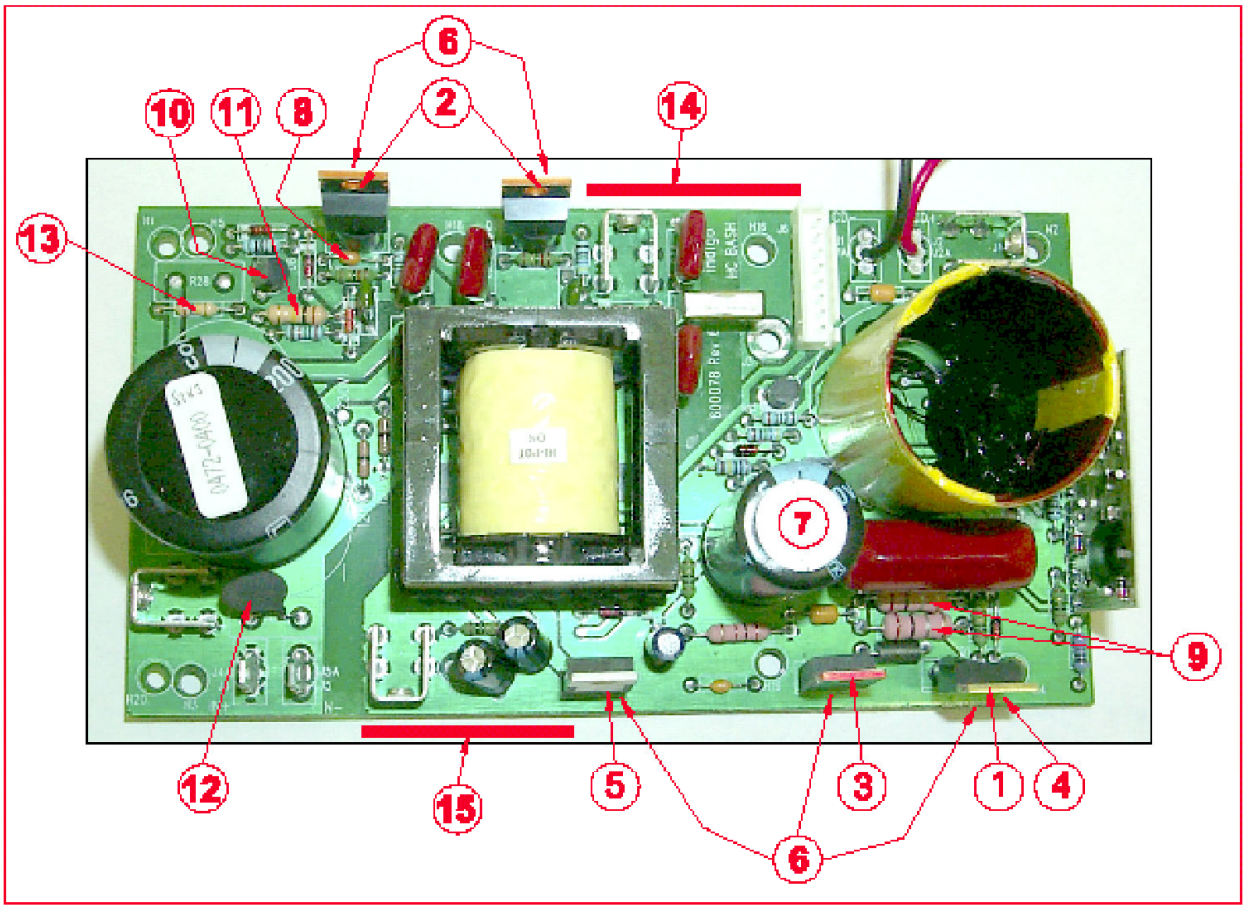


FIGURE 2 LINEAR BOARD UPGRADE
(Most components absent for clarity)

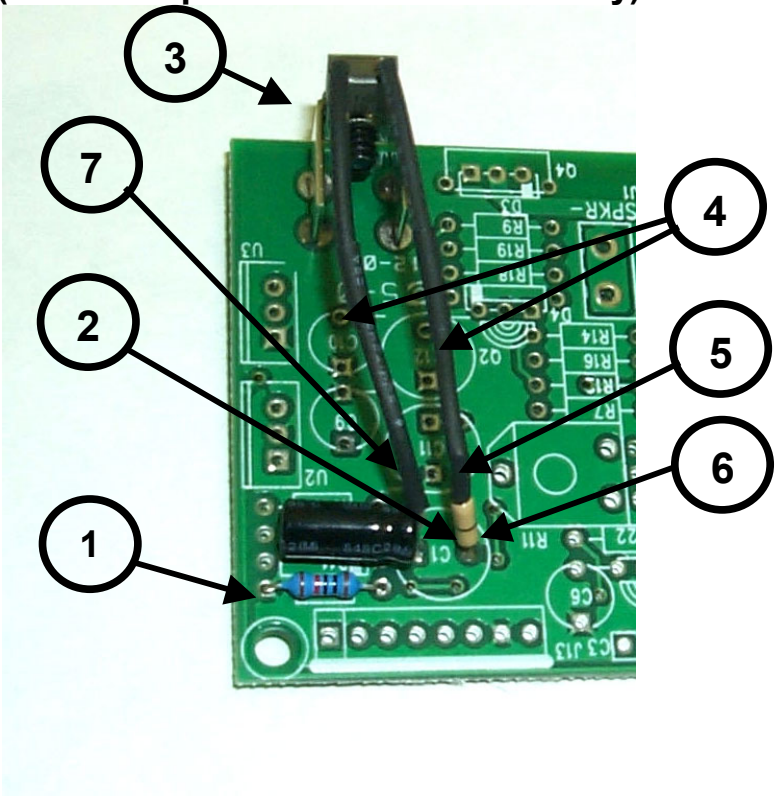
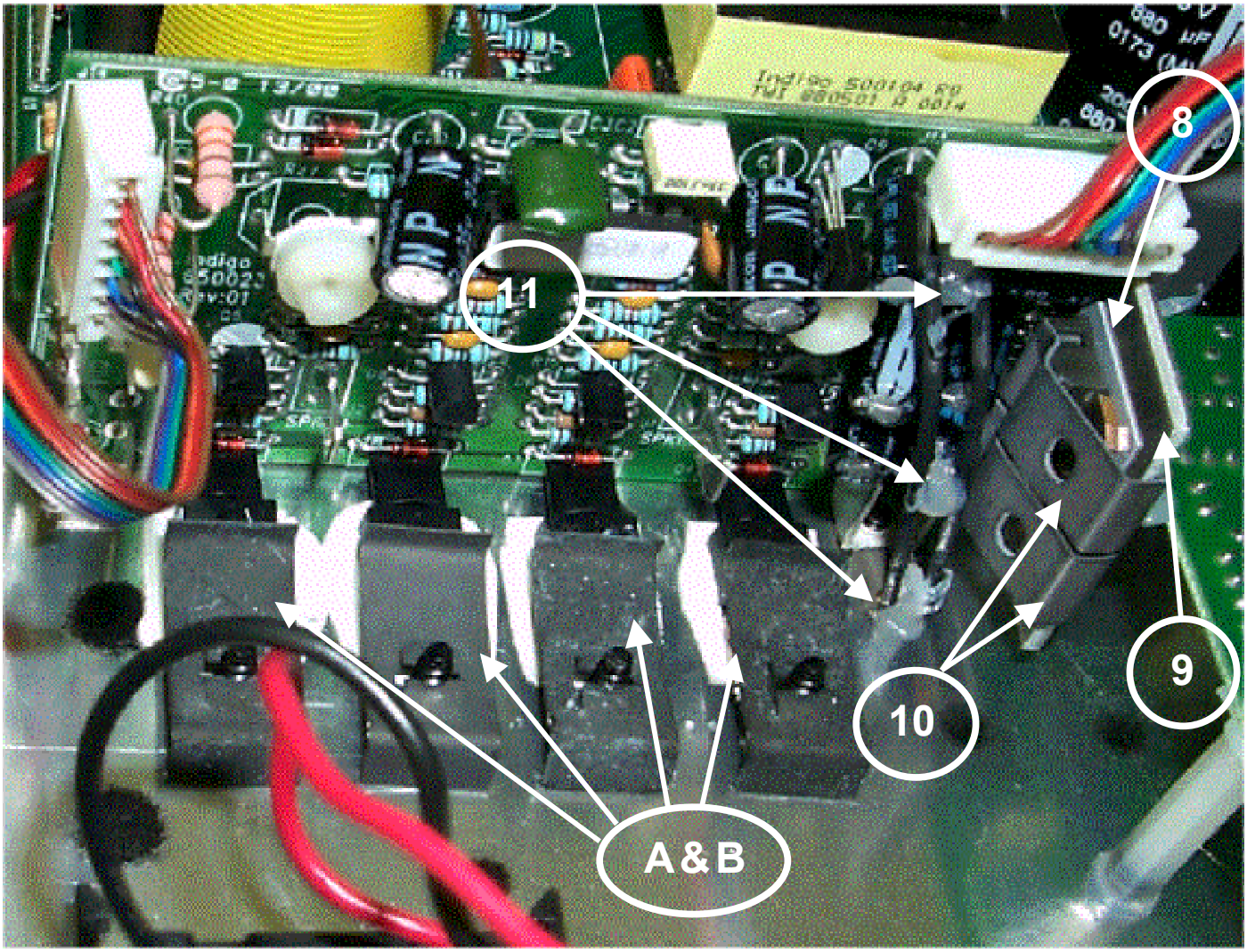


FIGURE 3 LINEAR BOARD UPGRADE (cont'd)

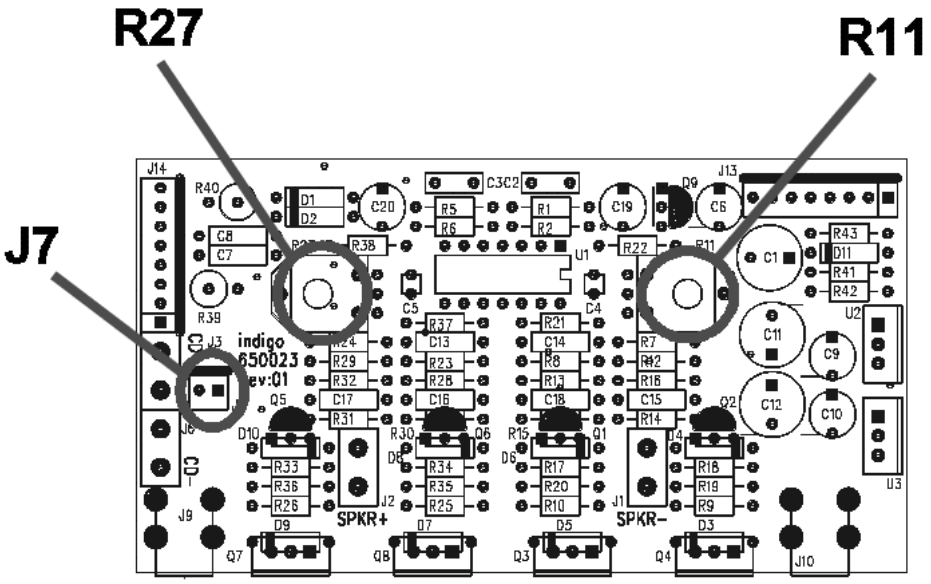


Model	Identification 120V	STATUS	ACTION
Modulus MSW-1	No Label	Needs Reliability Upgrade	Follow Steps Outlined Above
Modulus MSW-1	Small White Rectangular label On Amp faceplate "Rev II 2002-XXX"	Modified by factory	NONE REQUIRED

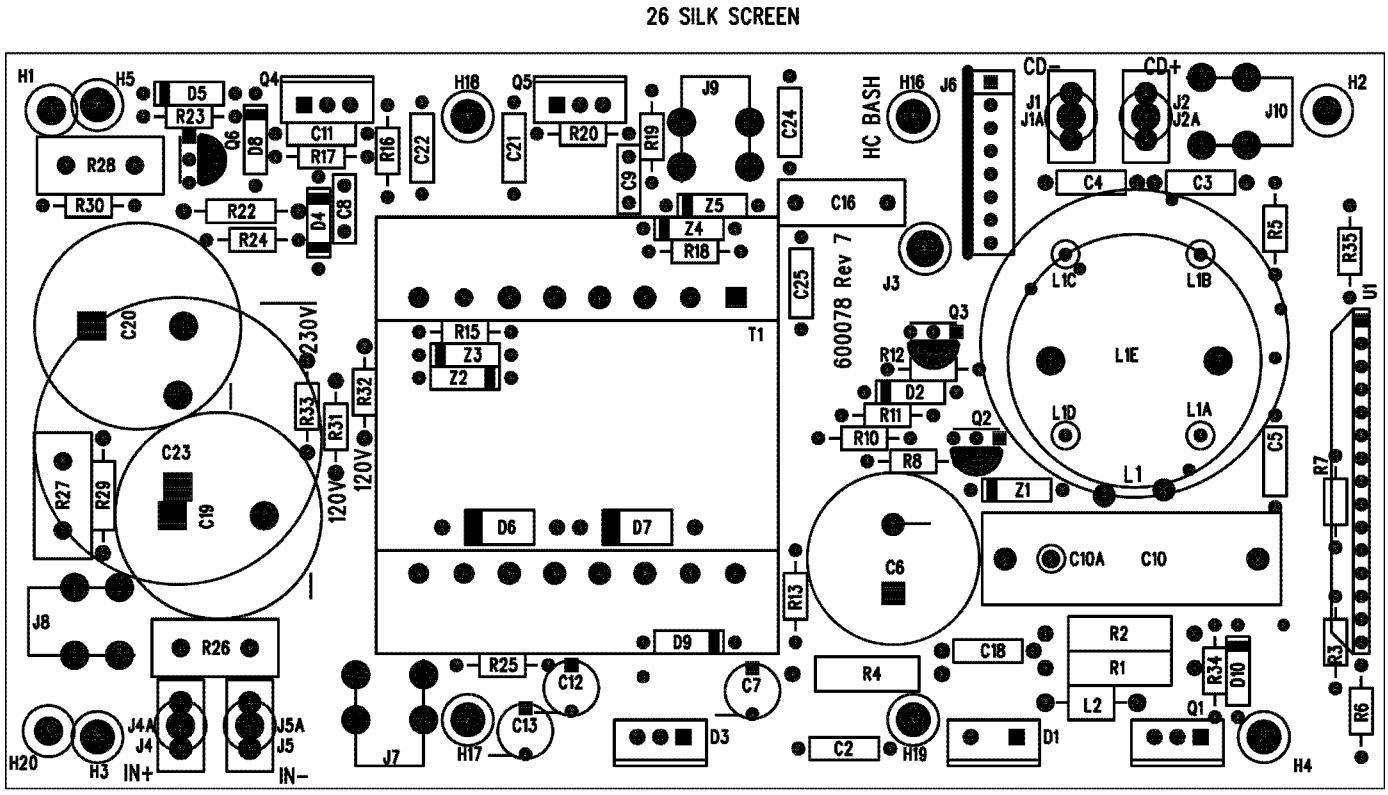
MSW-1 ADJUST BIAS PROCEDURE

(Mandatory when any output MOSFET transistors Q3,4,7,8 are replaced)

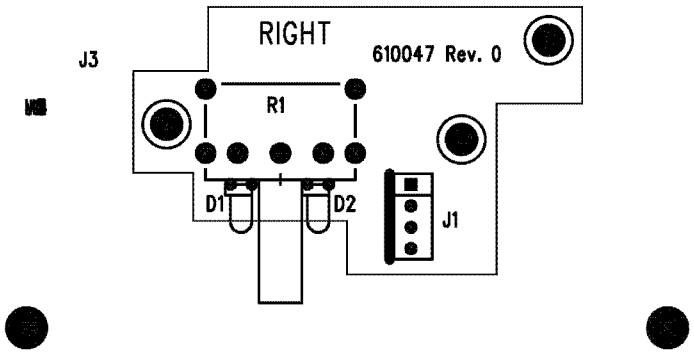
1. Amplifier should be unplugged and OFF.
2. Remove Amp assembly from cabinet; remove rear plastic cover if present. All wires exiting the cover can remain connected unless they will prevent you from removing the amplifier or accessing potentiometers on the Linear board PCB in the following steps.
3. Locate the Linear board assembly (PCB with the output transistors)
4. Adjust R11 and R27 fully Counter Clockwise. See diagram below.
5. Apply 120 VAC power to unit, Turn power switch ON.
6. Verify LED illuminates on the front gain control dial unless you have disconnected the plug.
7. Remove shorting plug on terminal J7 on Linear board, and insert current meter, set to the low mA range.
8. Verify initial current is less then 1 mA.
9. Adjust R11 Clockwise until current meter reads **5 mA** + the initial current from step #8.
10. Adjust R27 Clockwise until current meter now reads **10 mA** + the initial current from step #8.
11. Turn amplifier OFF. Disconnect AC power to unit.
12. Remove current meter; insert shorting plug back in terminal J7.
13. Replace cover (if present), wires if disconnected, and replace amplifier back into cabinet.



300W HC BASH Power Supply 230V/120V / Volume Right Board



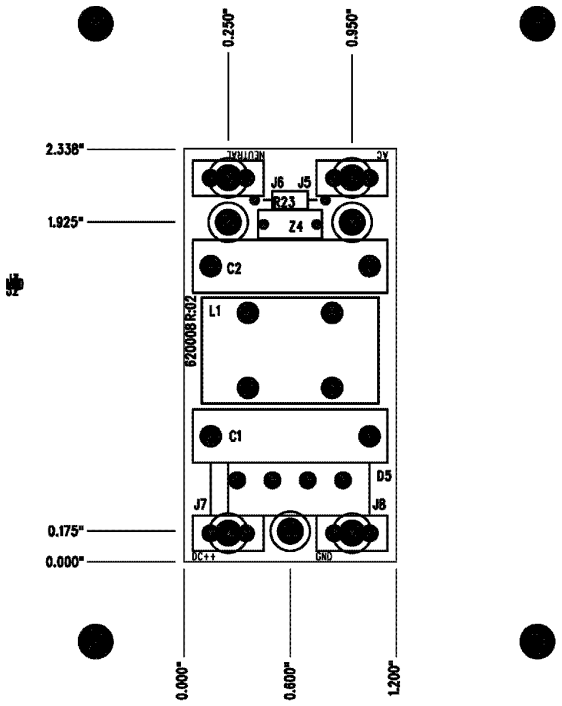
300W HC BASH Power Supply 230V / 120V



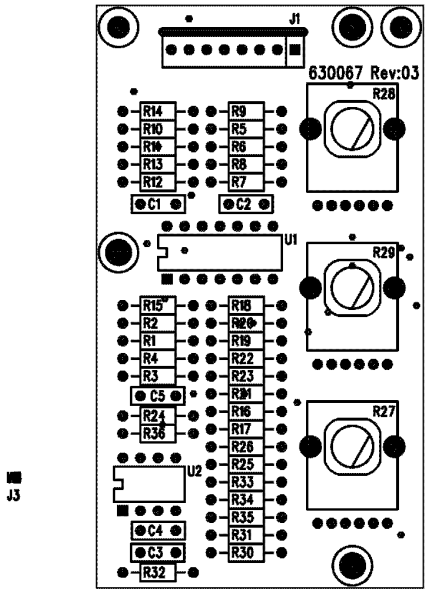
VOLUME RIGHT BOARD

00534-1

HC BASH 300W EM BOARD/IL RABOS BOARD



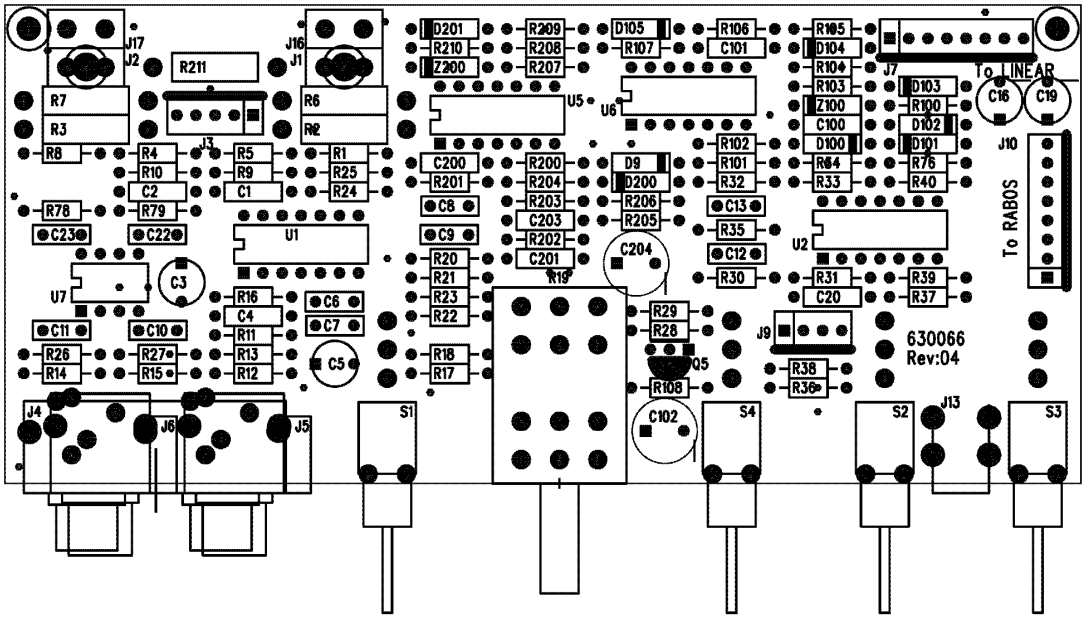
HC BASH 300W EMI BOARD



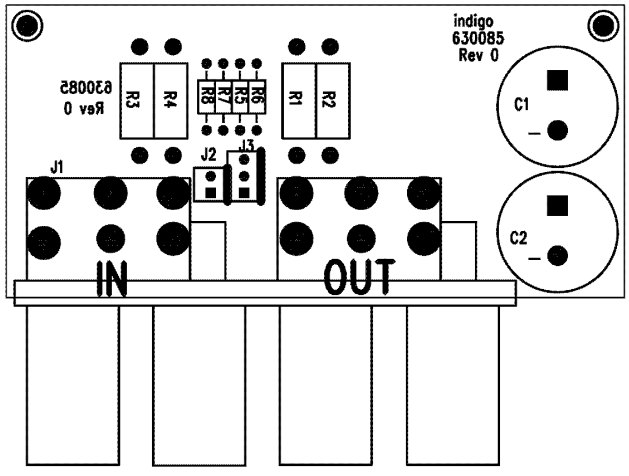
00534-2

IL Rabos Board

IL FEATURE BOARD/HI LEVEL BOARD



IL Feature Board



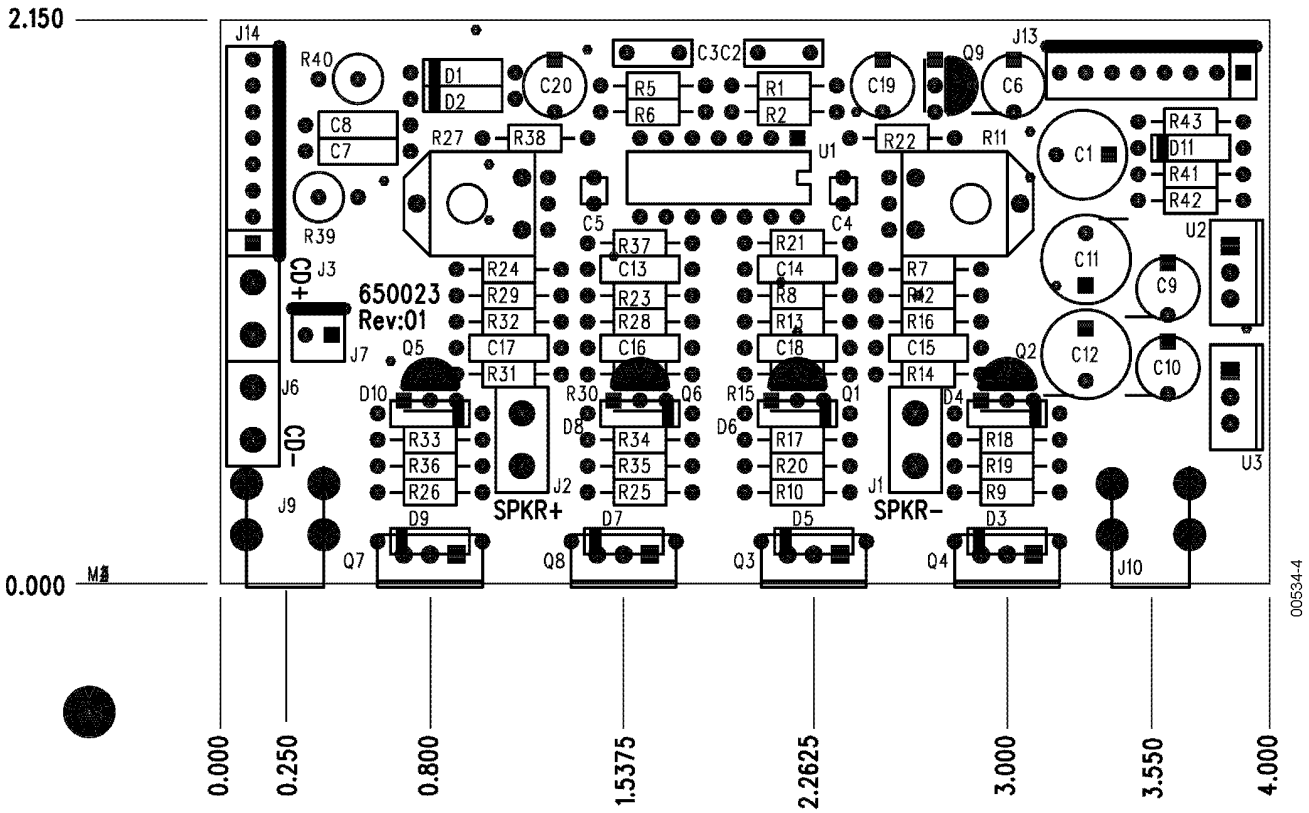
SILKSCREEN

630085 Rev. 0

SOLDER SIDE

HI LEVEL BOARD

HC BASH 300W LINEAR BOARD



HC BASH 300W Linear Board

ELECTRICAL PARTS LIST

Part#	Reference Designator	Qty	Description
PCB, FEATURE MAIN			
SEMICONDUCTORS			
UA0003	U5,U6	2	OPAMP, QUAD 14PIN DIL LM324N
UA0009	U1,U2	2	OPAMP, QUAD 14P DIL TL074/084
QM0035	Q5	1	JFET, N-CH J111 TO92 TR
DS0001	D9,D100,D101,D102,D103,D104, D105,D200,D201	9	RECT, 100mA 75V SIGNAL 1N4148T
DZ0002	Z200	1	ZENER, 500mW 12V 5% 1N5242B
DZ0014	Z100	1	ZENER, 500MW 14V 5% 1N5244B
CAPACITORS			
CC0020	C200	1	CAP, CA 470PF 100V 5%
CC0025	C203	1	CAP, CA 1000PF 100V 10%
CC0072	C1,C2,C4,C20,C100,C101	6	CAP, CA 100PF 100V NPO 10%
CC0082	C201	1	CAP, CA .1UF 50V 20%
CE0013	C204	1	CAP, E 47UF 50V 20% 5MMLS
CE0101	C16,C19	2	CAP, E 4.7UF 50V 85D 5X11 5MML
CE0103	C102	1	CAP, E 100UF 35V 85DEG 5MMLS
CE0108	C3,C5	2	CAP, E 4.7UF 16V BIPOLAR 5X11
CF0104	C12,C13	2	CAP, F 1UF 63V 5% 5MMLS
CF0125	C6,C8	2	CAP, F .068UF 100V 5% 5MMLS
CF0128	C7,C9	2	CAP, F .033UF 100V 5% 5MMLS
RESISTORS			
RC0001	R211	1	RES, CF 1K0 1/2W 5%
RC0273	R1,R4,R20,R24	4	RES, ZERO OHM 1/4W
RC0290	R206	1	RES, CF 9M1 1/4W 5%
RM0001	R33	1	RES, MF 1K00 1/4W 1%
RM0002	R12,R13,R37,R38,R39,R100,R101,R102,R208,R209	10	RES, MF 10K0 1/4W 1%
RM0003	R200,R210	2	RES, MF 15K0 1/4W 1%
RM0011	R103,R105,R201	3	RES, MF 100K 1/4W 1%
RM0024	R207	1	RES, MF 2K21 1/4W 1%
RM0027	R17,R18,R22,R23	4	RES, MF 33K2 1/4W 1%
RM0031	R204	1	RES, MF 3K32 1/4W 1%
RM0045	R104	1	RES, MF 7K68 1/4W 1%
RM0065	R30	1	RES, MF 200R 1/4W 1%
RM0075	R205	1	RES, MF 475R 1/4W 1%
RM0079	R76	1	RES, MF 750R 1/4W 1%
RM0085	R107	1	RES, MF 2K00 1/4W 1%
RM0120	R9,R10	2	RES, MF 30K1 1/4W 1%
RM0136	R202	1	RES, MF 150K 1/4W 1%

ELECTRICAL PARTS LIST (Cont.)

Part#	Reference Designator	Qty	Description
RM0144	R16	1	RES, MF 47K5 1/4W 1%
RM0156	R108	1	RES, MF 392K 1/4W 1%
RM0163	R28,R29	2	RES, MF 2K80 1/4W 1%
RM0165	R32	1	RES, MF 24K9 1/4W 1%
RM0171	R31,R203	2	RES, MF 475K 1/4W 1%
RM0188	R106	1	RES, MF 499R 1/4W 1%
RM0277	R11	1	RES, MF 86K6 1/4W 1%
RM0281	R35	1	RES, MF 6K04 1/4W 1%
RC0273	R19A,R19B,R19C,R19D	4	RES, ZERO OHM 1/4W
Miscellaneous			
JC0049	J4	1	CNCTR, DUAL JACK RCA
JH0006	J9	1	CNCTR, HEADER 4PIN .100CTR
JH0028	J3	1	CNCTR, HEADER 3PIN .100CTR
JH0074	J7,J10	2	CNCTR, HEADER 8PIN LOCKING.1C
MM0025	J13	1	MISC, PC MT SCREW TERM 6-32
SR0007	S1,S2,S3,S4	4	SWITCH, SPDT TOGGLE C/W CAP PC
PCB, LINEAR BD			
SEMICONDUCTORS			
DS0001	D1,D2,D3,D4,D5,D6,D7,D8,D9,D10, D11	11	RECT, 100mA 75V SIGNAL 1N4148T
QB0017	Q2,Q6	2	TRANS, NPN 150V 0.6A 2N5551TR
QB0018	Q1,Q5	2	TRANS, PNP 150V 0.6A 2N5401TR
QM0034	Q4,Q8	2	MOSFET, IRF9540 TO220AB
QM0036	Q3,Q7	2	MOSFET, IRF530 TO220
QM0054	Q9	1	JFET, N-CH J113 TO92
UA0009	U1	1	OPAMP, QUAD 14P DIL TL074/084
UV0010	U2	1	VREG, +15V 500MA LM7815CT
UV0011	U3	1	VREG, -15V 500MA LM7915CT
CAPACITORS			
CC0025	C15,C16,C17,C18	4	CAP, CA 1000PF 100V 10%
CC0080	C13,C14	2	CAP, CA 220P 100V 10%
CC0082	C7,C8	2	CAP, CA .1UF 50V 20%
CE0003	C6	1	CAP, E 2.2UF 50V 20% 105C
CE0013	C9,C10	2	CAP, E 47UF 50V 20% 5MMLS
CE0018	C11,C12	2	CAP, E 100UF 25V 20% 5MMLS
CE0106	C19,C20	2	CAP, E 22UF 35V BP 8X11 5MMLS
CE0116	C1	1	CAP, E 2.2UF 50V BP 6X11 5MMLS
CF0125	C3	1	CAP, F .068UF 100V 5% 5MMLS
CF0128	C2	1	CAP, F .033UF 100V 5% 5MMLS
CC0097	C4,C5	2	CAP, C 10P 50V 10%

ELECTRICAL PARTS LIST (Cont.)

Part#	Reference Designator	Qty	Description
RESISTORS			
RC0273	R19,R20,R35,R36	4	RES, ZERO OHM 1/4W
RM0001	R12,R13,R14,R15,R28,R29,R30,R31	8	RES, MF 1K00 1/4W 1%
RM0002	R1,R2,R5,R6,R22,R38,R41,R42	8	RES, MF 10K0 1/4W 1%
RM0021	R7,R8,R23,R24	4	RES, MF 1K82 1/4W 1%
RM0024	R17,R18,R33,R34	4	RES, MF 2K21 1/4W 1%
RM0027	R21,R37	2	RES, MF 33K2 1/4W 1%
RM0029	R9,R10,R25,R26	4	RES, MF 3K01 1/4W 1%
RM0144	R43	1	RES, MF 47K5 1/4W 1%
RM0180	R16,R32	2	RES, MF 4K99 1/4W 1%
RP0059	R11,R27	2	POT, 2K 8MM TOP ADJ/COVER
RX0048	R39,R40	2	RES, MO 330R 1W 5%
Miscellaneous			
JH0016	J7	1	CNCTR, HEADER 2PIN .100CTR
JH0074	J13,J14	2	CNCTR, HEADER 8PIN LOCKING .1C
MM0025	J9,J10	2	MISC, PC MT SCREW TERM 6-32
MT0003	J1	1	TERM, FASTON MALE PCMT 250X032
MT0023	J3,J6	2	TERM, FASTON MALE PCMT 187X032
MT0036	J2	1	TERM, FASTON MALE PCMT 205X032
PCB, POWER SUPPLY			
SEMICONDUCTORS			
DR0086	D6,D7	2	RECT, 1A 600V ULTRAFAST MUR160
DS0001	D2,D10	2	RECT, 100mA 75V SIGNAL 1N4148T
DS0002	D5,D8,D9	3	RECT, 100MA 200V SIGNAL 1N3070
DZ0004	Z1	1	ZENER, 500mW 18V 5% 1N5248B
DZ0021	Z2,Z3,Z4,Z5	4	ZENER, 500MW 15V 5% 1N5245B
QB0002	Q2	1	TRANS, NPN 40V .6A TO92 2N4401
QB0014	Q6	1	TRANS, PNP TO92 MPSA92TR
QB0017	Q3	1	TRANS, NPN 150V 0.6A 2N5551TR
DD0003	D4	1	RECT, 1A2 60V DIAC
DR0026	D3	1	RECT, 16A 200V CATHODE FEP16DT
DR0087	D1	1	RECT, 15A 200V ULTRA MUR1540
HC1011	U1	1	HYBRID, THK FILM HC BUCK CNTR
QM0004	Q4,Q5	2	MOSFET, IRF740 TO220AB
QM0020	Q1	1	MOSFET, IRF540 TO220AB
CAPACITORS			
CC0025	C2	1	CAP, CA 1000PF 100V 10%
CC0040	C11	1	CAP, CA 4700PF 100V 10%
CC0059	C3,C4,C5,C18	4	CAP, CA .1UF 100V 20%

ELECTRICAL PARTS LIST (Cont.)

Part#	Reference Designator	Qty	Description
CE0013	C12,C13	2	CAP, E 47UF 50V 20% 5MMLS
CE0098	C7	1	CAP, E 22UF 50V 20% 5X11 5MMLS
CF0019	C8,C9	2	CAP, F 4700PF 100V 5% 5MMLS
CF0151	C21,C22,C24,C25	4	CAP, F .1UF 250V 10% 5MMLS
CC0130	C16	1	CAP, CY1 4700PF 250V 20% .4LS
CE0040	C23	1	CAP, E 680UF 200V 25X35 85DEG
CE0110	C6	1	CAP, E 1000UF 100V 18X40
CF0050	C21,C22,C24,C25	4	CAP, F .1UF 250V 10% 10MMLS
CF0146	C10	1	CAP, F 6.8UF 250V 10% 27MMLS
RESISTORS			
RC0082	R22	1	RES, CF 100K 1/2W 5%
RC0128	R35	1	RES, CF 33K 1/4W 5%
RC0136	R30	1	RES, CF 160K 1/4W 5%
RC0273	R31,R32	3	RES, ZERO OHM 1/4W
RM0001	R23	1	RES, MF 1K00 1/4W 1%
RM0002	R8	1	RES, MF 10K0 1/4W 1%
RM0035	R11	1	RES, MF 4K75 1/4W 1%
RM0039	R6	1	RES, MF 5K11 1/4W 1%
RM0065	R12	1	RES, MF 200R 1/4W 1%
RM0075	R15,R16,R18,R19	4	RES, MF 475R 1/4W 1%
RM0111	R7	1	RES, MF 17K8 1/4W 1%
RM0123	R5	1	RES, MF 36K5 1/4W 1%
RM0198	R24	1	RES, MF 205K 1/4W 1%
RM0260	R10	1	RES, MF 1M0 1/4W 1%
RM0339	R3,R13,R25,R34	4	RES, MF 10R 0.6W 1% FLAMEPROOF
RM0340	R17,R20	2	RES, MF 22R 0.6W 1% FLAMEPROOF
RX0072	R4	1	RES, MO 100R 1W 5%
KS0020	R26	1	SURGISTOR, 10R 2A CL-110
RW0022	R1,R2	2	RES, WW 0R1 2W 5%
Miscellaneous			
480007	J1	1	SUB, #18B 4 187X032/1/4 STRP
480029	J2	1	SUB, #18R 4 187X032/1/4STRP
500104	T1	1	XFMR, POWER 100V HC TRAN ETD39
540131	L1	1	IND, 25UH UPRIGHT AIR COIL
BF0007	L2	1	BEAD, FERRITE
JH0074	J6	1	CNCTR, HEADER 8PIN LOCKING .1C
MM0025	J7,J8,J9,J10	4	MISC, PC MT SCREW TERM 6-32
MT0023	J4,J5	2	TERM, FASTON MALE PCMT 187X032

ELECTRICAL PARTS LIST (Cont.)

Part#	Reference Designator	Qty	Description
PCB, EMI FILTER			
DB0009	D5	1	RECT, 6A 400V BRIDGE
CF0057	C1,C2	2	CAP, FX .22UF 250V 10%
RC0004	R23	1	RES, CF 1M0 1/4W 5%
540124	L1	1	IND, CM CHOKE YT7271
KV0001	Z4	1	VARISTOR, 275V 100J .6W
480007	J5,J6,J8	3	SUB, #18B 4 187X032/1/4 STRP
480029	J7	1	SUB, #18R 4 187X032/1/4STRP
PCB, VOLUME MODULUS RIGHT			
DL0014	D1,D2	2	LED, 3MM BICOLOR RED/GR
RP0097	R1	1	POT, A10K SINGLE/BRKT D SHAFT
JH0006	J1	1	CNCTR, HEADER 4PIN .100CTR
JC0169A		1	CNCTR, FEM-MA HARNESS 4PSH 15 USED ON LOCATION J1
RP0103		1	POT, KNOB LEVEL R
PCB, INPUT HI LEVEL BAL/OPT			
RM0011	R5,R6,R7,R8	4	RES, MF 100K 1/4W 1%
RX0001	R3,R4	2	RES, MO 1K 1W 5%
RX0098	R1,R2	2	RES, MO 510R 2W 5%
CE0137	C1,C2	2	CAP, E 470UF 100V BP 18X42
JC0070	J1	1	CNCTR, 8PIN SPKR JACK RTANG
JH0028	J3	1	CNCTR, HEADER 3PIN .100CTR
RABOS Board			
SEMICONDUCTORS			
UA0009	U1	1	OPAMP, QUAD 14P DIL TL074/084
UA0010	U2	1	OPAMP, DUAL 8PIN DIL TL082
RESISTORS			
RM0001	R24,R25,R33	3	RES, MF 1K00 1/4W 1%
RM0002	R1,R2,R4,R9,R14,R15,R21,R23	8	RES, MF 10K0 1/4W 1%
RM0003	R8,R13	2	RES, MF 15K0 1/4W 1%
RM0012	R3	1	RES, MF 100R 1/4W 1%
RM0013	R34	1	RES, MF 11K0 1/4W 1%
RM0024	R22	1	RES, MF 2K21 1/4W 1%
RM0042	R26	1	RES, MF 681R 1/4W 1%
RM0073	R30	1	RES, MF 392R 1/4W 1%
RM0080	R5,R10	2	RES, MF 825R 1/4W 1%
RM0179	R32	1	RES, MF 66K5 1/4W 1%
RM0260	R36	1	RES, MF 1M0 1/4W 1%
RM0271	R19	1	RES, MF 110K 1/4W 1%

ELECTRICAL PARTS LIST (Cont.)

Part#	Reference Designator	Qty	Description
RM0281	R7,R12	2	RES, MF 6K04 1/4W 1%
RM0304	R35	1	RES, MF 7K87 1/4W 1%
RM0315	R17	1	RES, MF 2K67 1/4W 1%
RM0321	R31	1	RES, MF 1K27 1/4W 1%
RM0369	R6,R11	2	RES, MF 340R 1/4W 1%
RM0370	R18	1	RES, MF 9K31 1/4W 1%
RM0377	R16	1	RES, MF 3K57 1/4W 1%
RM0378	R20	1	RES, MF 549R 1/4W 1%
RP0087	R27,R29	2	POT, A10K DUAL 12MM HOR 5%
RP0088	R28	1	POT, C10K DUAL -10% MID 1.5K
CAPACITORS			
CF0045	C1,C2,C5	3	CAP, F .1UF 63DC 5% 5MMLS
CF0125	C3	1	CAP, F .068UF 100V 5% 5MMLS
CF0135	C4	1	CAP, F .18UF 50V 5% 5MMLS
Miscellaneous			
JH0074	J1	1	CNCTR, HEADER 8PIN LOCKING .1C
MISCELLANEOUS			
480121		1	SUB, #16B 30 205X032/205X032 SPEAKER WIRE
480122		1	SUB, #16R 30 250X032/250X032 SPEAKER WIRE
810056		7	MET, HTSNK CLIP .9X.5X.2 FET 3PER USED ON D1,D3,Q1 ON MAIN BOARD; 4PER USED ON Q3,Q4,Q7,Q8 ON LINEAR BOARD
810066		2	MET, HTSNK CLIP HPS SERIES USED Q4,Q5 ON MAIN BOARD
810091		1	MET, HTSNK SEC 3FET RP5 USED ON 600078
810092		1	MET, HTSNK PRI 2FET RP5 USED ON 600078
930050		1	CUP, AMP BUCKET
FH0012		1	FUSE, HOLDER PANEL MT SEALED
FS0022		1	FUSE, 3A 250V 1.25X.25 GLASS
HS0004		5	SCREW, #6-32X1/4 PAN PHIL ZNP 1PER USED ON MZ0003; 4PER USED ON MM0025
HS0062		7	SCREW, #6-1/2 TYPE B PP BLK USED ON FETS
HS0065		1	SCREW, #6-32X1/4 PAN PHIL BLK USED ON MZ0003

ELECTRICAL PARTS LIST (Cont.)

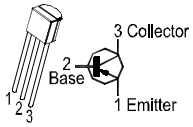
Part#	Reference Designator	Qty	Description
HS0067		12	SCREW, #6-3/8 TYPE A PP BLK 6PER USED ON MZ0030; 3PER USED ON MZ0040; 3PER USED ON MM0025
HS0078		5	SCREW, #4-24X1/2 HL PP BLK 2PER USED ON JC0070; 2PER USED ON JC0052; 1PER USED ON CUP
JC0071		2	CNCTR, FEM-FEM HARNESS 8PIN 9 1 USED ON FEATURE LINEAR; 1 USED ON LINEAR MAIN
JC0072		1	CNCTR, 2PIN MINI JUMPER(SHUNT) TO SET BIAS ON LINEAR BOARD AT LOCATION J7
JC0093		1	CNCTR, FEM-FEM HARNESS 3P 7.5 USED WITH FEATURE AND HI LEVEL BOARD
JC0111		1	CNCTR, 8PIN RIBBON CABLE 3 USED ON THE RABOS ASSEMBLY
JC0129		1	CNCTR, AC IEC SOCKET .250 2PIN
JC0169C		1	CNCTR, FEM-FEM HARNESS 4PS 28 USED ON J9
MM0069		3	MISC, RUBBER GROMMET FREQ,LEVEL,WIDTH ON FRONT PANEL
MS0005		7	SILPAD, .009 .3C/W TO3P 3PER USED ON MAI BOARD; 4PER USED ON THE LINEAR BOARD
MSW-1 PANEL		1	MODULUS MSW-1 PANEL COMPLETE
MZ0003		1	STANDOFF, 6-32 3/8 ROUND AL USED ON THE MAIN BOARD
MZ0030		6	STANDOFF, 3/8 NYLON 3PC USED ON 600078 BOARD; 3PC USED ON 620008 BOARD
MZ0040		3	STANDOFF, 30MM NYLON USED ON THE RABOS BOARD
SR0032		1	SWITCH, ROCKER TV5

INTEGRATED CIRCUIT DIAGRAMS

JFET, J111, J113,
Q5, Q9

1. D
2. S
3. G

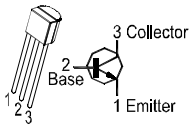
TRANS, PNP, 150V, 0.6A,
2N5401TR, 2N4401
Q1, Q5, Q3



U1 HYBRID IC

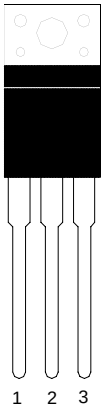
1	DC SENSE		
2	PWM SPLY	I LIMIT	15
3	TRACK SIG	GATE	14
4	AUD GND	PWM GND	13
5	IN BIAS	PWM DC	12
6	PWR GND	I SENSE	11
7	PWM DC	PWM GAIN	10
8	DC SPLY	PWM VSENSE	9

TRANS, NPN, 150V, 0.6A 2N5551TR,
MPSA92TR,
Q2, Q6, Q6



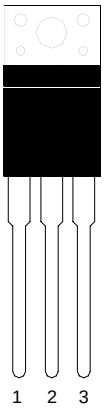
MOSFET,
IRF9540, IRF530,
IRF540, IRF740,
Q1, Q4, Q5, Q3,
Q7, Q4, Q8

1. G
2. D
3. S



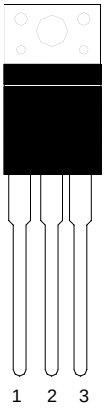
-15V, LM7915CT
REGULATOR
U3

1. GROUND
2. INPUT
3. OUTPUT

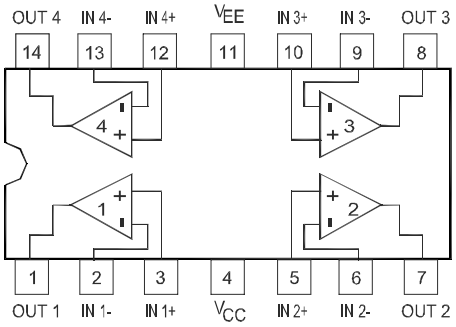


+15V, LM7815CT
REGULATOR
U2

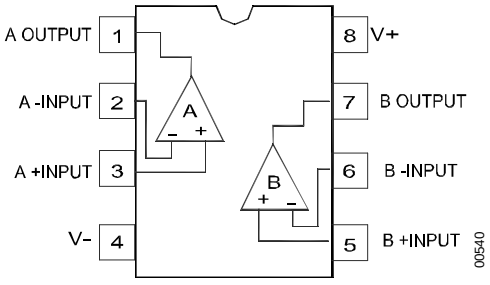
1. INPUT
2. GROUND
3. OUTPUT



QUAD OP AMP, 14 PIN DIL
LM324N, TL074/084
U5, U6, U1, U2

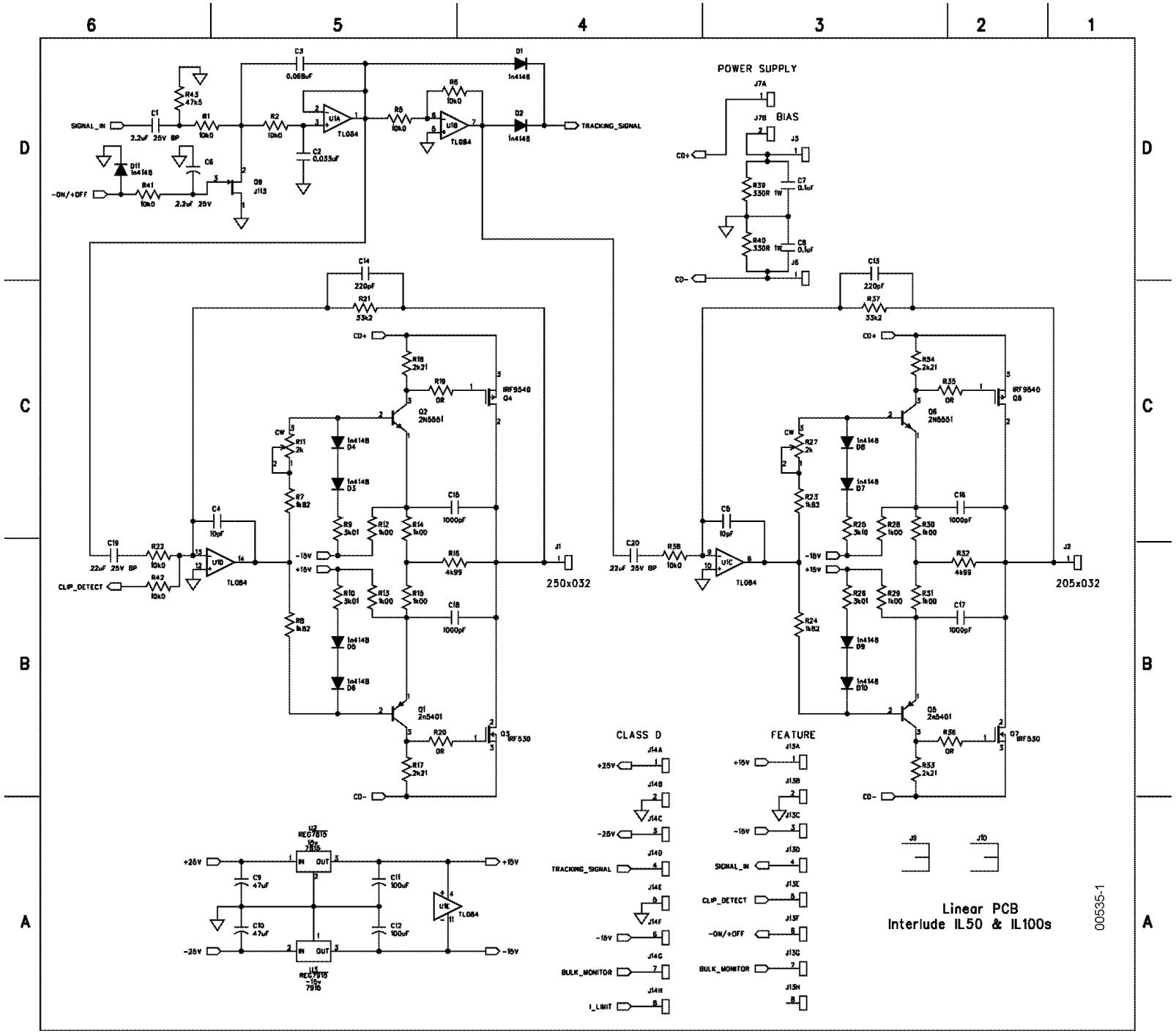


OPAMP, DUAL 8
PIN DIL, TLO82
U2

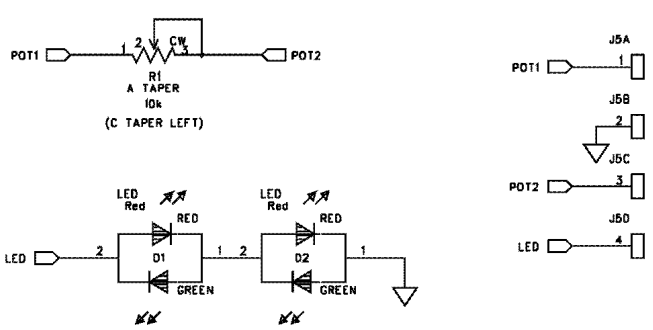


00540

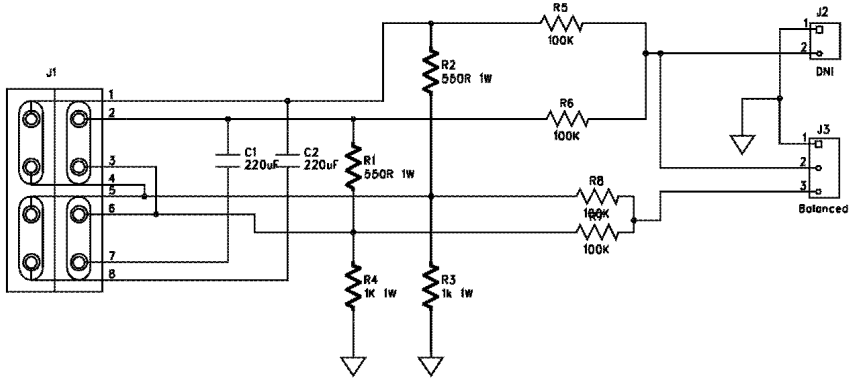
LINEAR PCB


POWER SUPPLY
BIAS
CLASS D
FEATURE
250x032
205x032
Linear PCB
Interlude IL50 & IL100s
00535-1

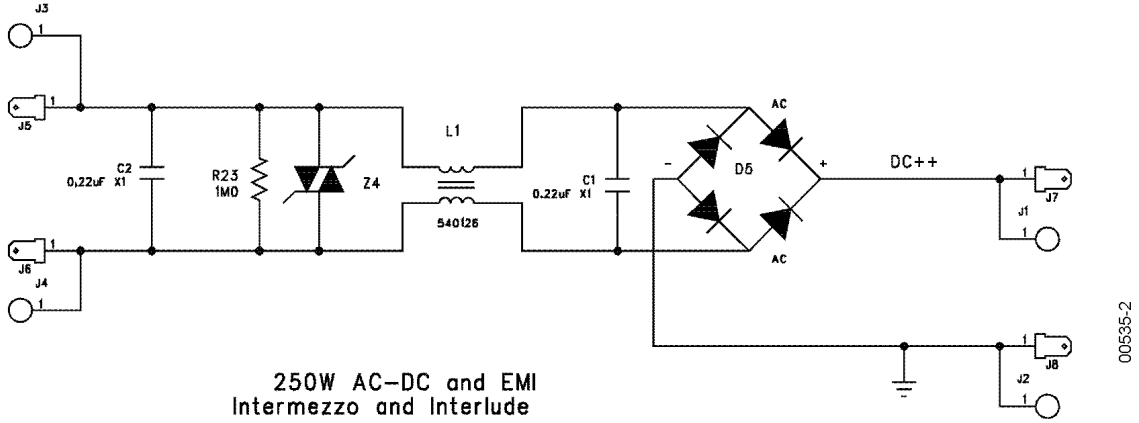
VOLUME /LC HI LEVEL/OPTIONAL BALANCE
250W AC-DC and EMI



INTERLUDE VOLUME BOARD (LEFT OR RIGHT)

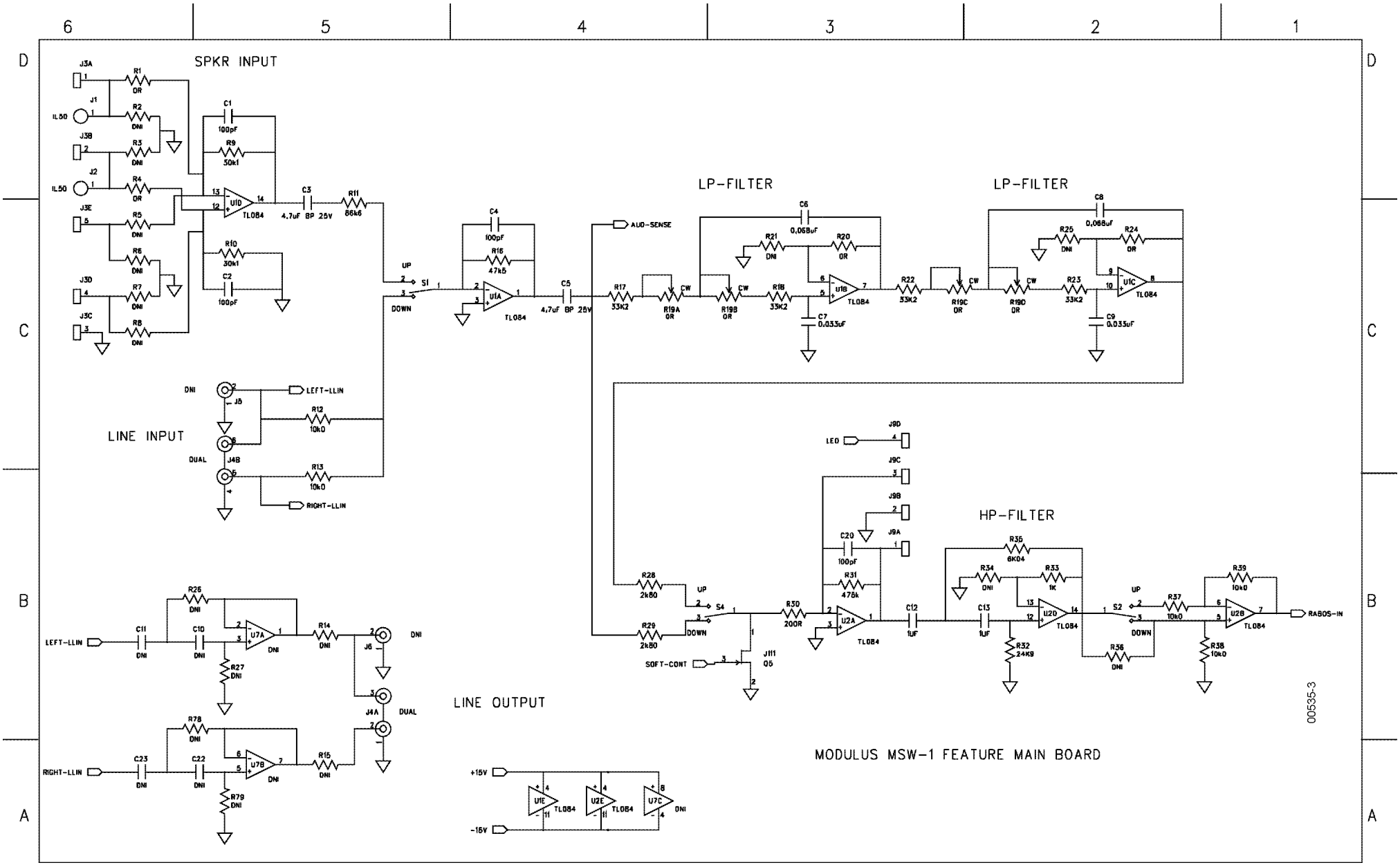


MODULUS MSW-1
LC Hi Level Board/Optional Balance

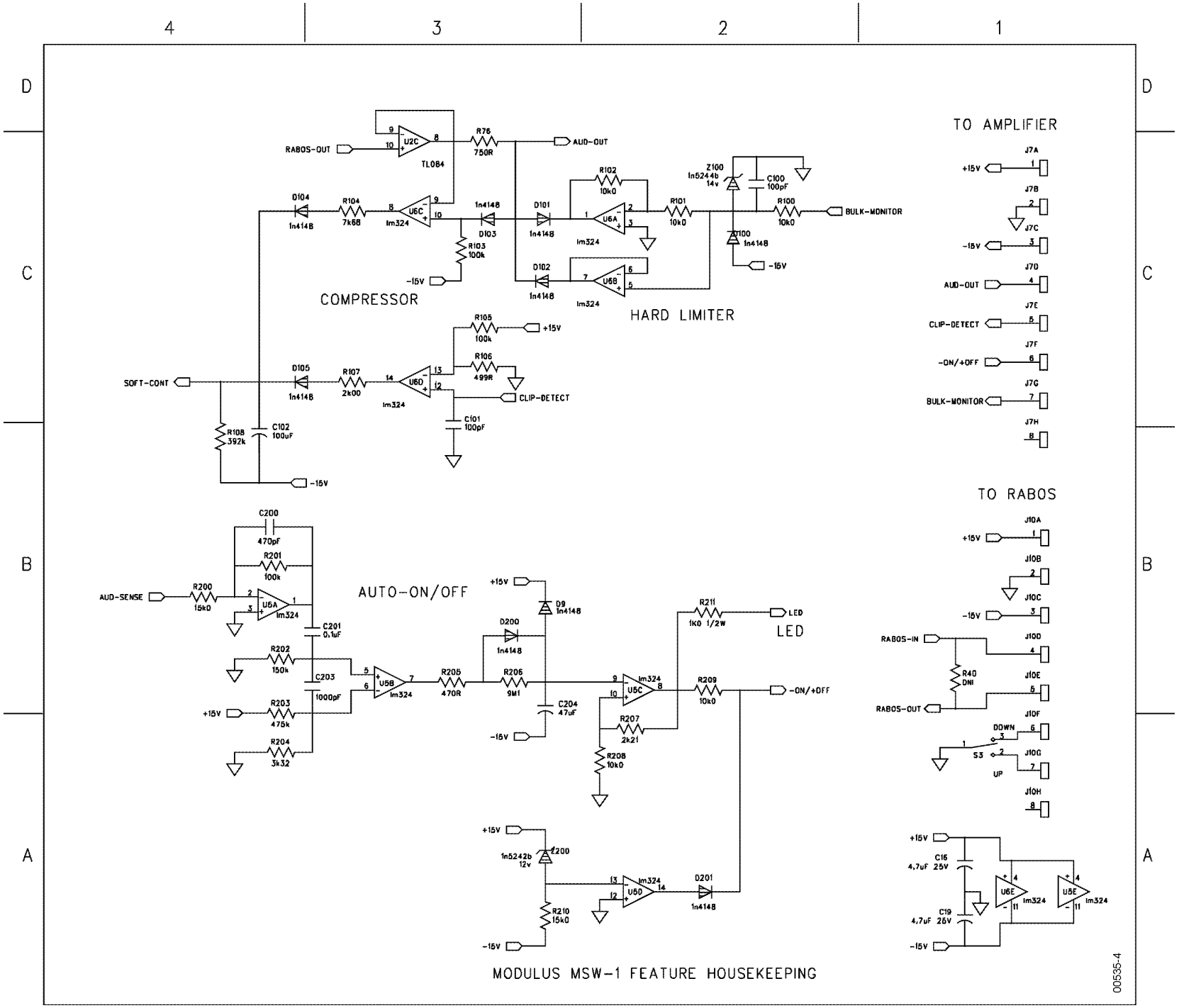


250W AC-DC and EMI
Intermezzo and Interlude

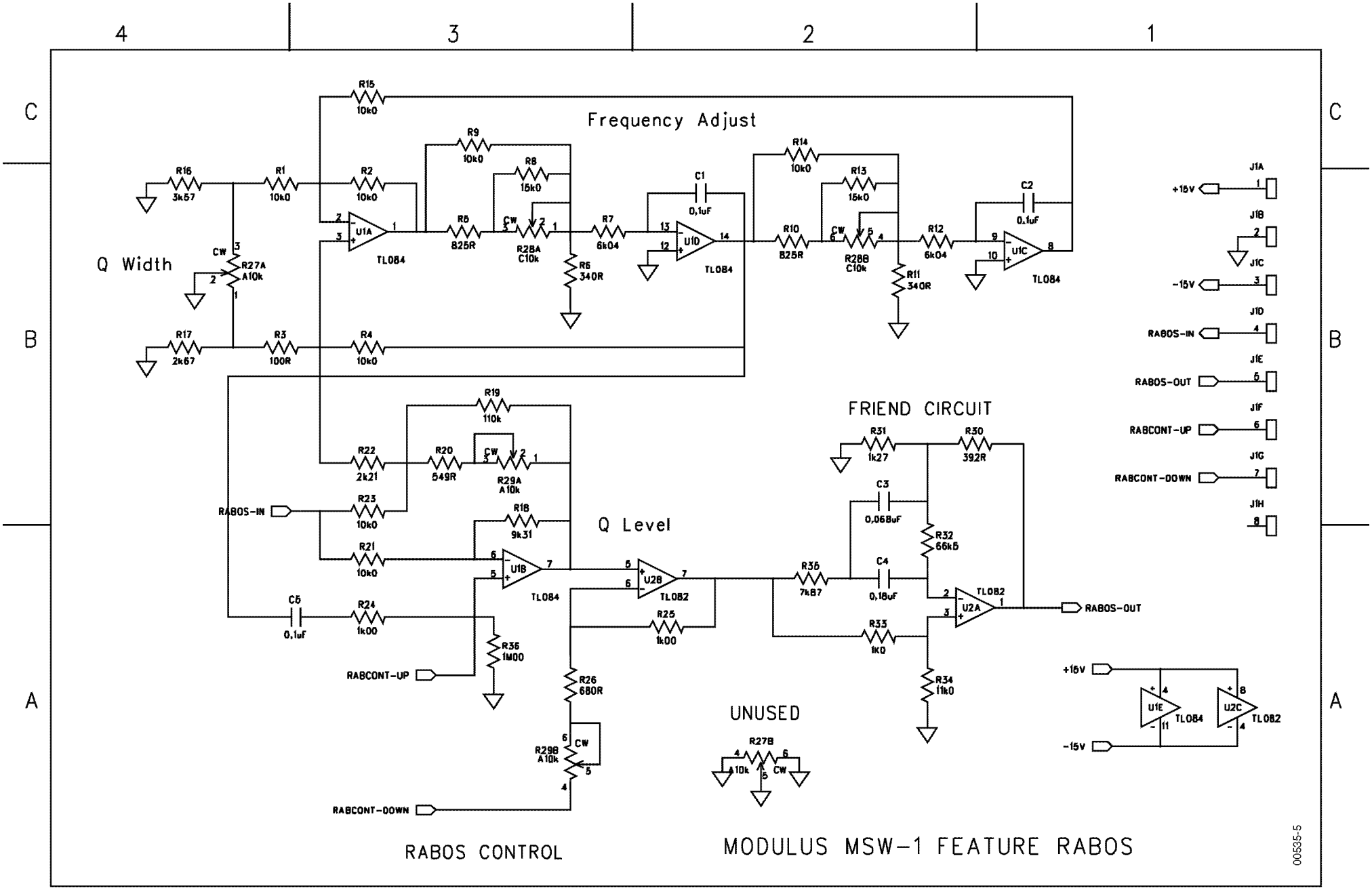
FEATURE MAIN BOARD



FEATURE HOUSEKEEPING



FEATURE RABOS



POWER SUPPLY